AWS A2.4:2007
An American National Standard

Standard Symbols for Welding, Brazing, and Nondestructive Examination

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Approved by the
American National Standards Institute
March 23, 2007

Standard Symbols for Welding, Brazing, and Nondestructive Examination

6th Edition

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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. Detailed information and examples are provided for the construction and interpretation of these symbols. This system provides a means of specifying welding or brazing operations as well as nondestructive examination, including the examination method, frequency, and extent.

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Dedication

This revision of AWS A2.4, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*, is respectfully dedicated to the memory of William Lee "Bill" Green, who served as the A2 and A2C Committee chair for many years.

The Committee sadly misses his leadership, wisdom, and friendship. His commitment to the advancement of symbols for welding, brazing, and nondestructive examination lives on in this new revision.

Godspeed, Bill Green.

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Foreword

This foreword is not part of AWS A2.4:2007, *Standard Symbols for Welding, Brazing, and Nondestructive Examination,* 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 among the designer, fabrication, and inspection personnel. Statements such as "to be welded throughout" or "to be completely welded," in effect, transfer the design responsibility from the designer to production personnel, who cannot be expected to know design requirements.

The symbols presented in this standard provide the means for placing welding, brazing, and nondestructive examination information on 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.

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.

AWS A2.4-76, *Symbols for Welding and Nondestructive Testing*, was the first revision of the combined documents and was prepared by the AWS Committee on Definitions and Symbols. It was revised in 1979 as A2.4-79, *Symbols for Welding and Nondestructive Testing, Including Brazing*, and again in 1986 with the title *Standard Symbols for Welding, Brazing, and Nondestructive Examination*. AWS A2.4:1998 was the second revision of the 1986 document and had the same title. AWS A2.4:2007 is the third revision of the 1986 document and has the same title, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*.

This edition has undergone extensive formatting modifications which have introduced new features including a scope, normative and informative references, and figures located closer to the referencing clauses. The user will also find paragraphs on SI dimensions for application to symbols and many examples of metric dimensions in the figures. One normative annex, titled Annex A Tables, has also been added to the current edition in order to facilitate locating table references with the addition of Table A.6 Examination Method Letter Designation. Six informative annexes follow the text and figures that comprise AWS A2.4:2007. Among the informative annexes the user will find Annex E Welding Symbol Chart in its updated form, including a section for contour symbols, and Annex F Guidelines for the Preparation of Inquiries for AWS Technical Committees.

The seventh edition of A2.4 also incorporates some revised technical content primarily in the Brazing Symbols area which currently details information on special application of symbols as well as braze fillet. Clause 3. Basic Welding Symbols briefly defines the basis of reference in a new subclause and is also revised to clarify Figures 1 through 3. Several of the sketches throughout the standard have been corrected and modified, such as those found in 5.12.2, 6.2.1, 10.6.2, and 11.7.2. Figures 30, 33, 41, and 49 were also altered in order to better portray the application of the plug weld symbol.

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, 550 N.W. LeJeune Road, Miami, FL 33126.

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Standard Symbols for Welding, Brazing, and Nondestructive Examination

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.

The figures included with the text are intended to show how the correct format and applications of symbols may be used to convey welding, brazing, and nondestructive examination information. They are not intended to represent recommended welding, brazing, nondestructive examination, or design practice.

The section addressing brazing uses the same symbols that are used for welding. The section on nondestructive examination symbols establishes the symbols to be used on drawings to specify nondestructive examination for determining the suitability of components. The nondestructive examination symbols included in this standard represent nondestructive examination methods as discussed in the latest edition of the AWS publication AWS B1.10, *Guide for the Nondestructive Examination of Welds*. Definitions and the details for the use of the various nondestructive examination methods are found in AWS B1.10.

For illustrative purposes, this standard makes use of both U.S. Customary and the International System of Units (SI). Examples featuring each system appear throughout the document.

Safety and health issues and concerns are beyond the scope of this standard, and therefore are not fully addressed herein. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, and applicable federal and state regulations.

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

2. Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this AWS standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this AWS standard are encouraged to investigate the possibility of applying the most recent editions of the documents shown below. For undated references, the latest edition of the standard referred to applies.

The following American Welding Society[1] standards are used in the mandatory sections of this document:

(1) AWS A3.0:2001, *Standard Welding Terms and Definitions*;

(2) AWS A5.30/A5.30M, *Specification for Consumable Inserts*; and

(3) AWS B1.10, *Guide for the Nondestructive Examination of Welds*.

3. Basic Welding Symbols

3.1 Distinction between *Weld Symbol* and *Welding Symbol*. This standard makes 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.

3.2 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 symbol points. The *other side* is the side of the joint opposite the arrow side.

3.3 Weld Symbols. Weld symbols shall be as shown in Figure 1. The symbols shall be drawn in contact with the reference line.

1. AWS standards are published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

3.4 Supplementary Welding Symbols. Supplementary symbols to be used in connection with welding symbols shall be as shown in Figure 2.

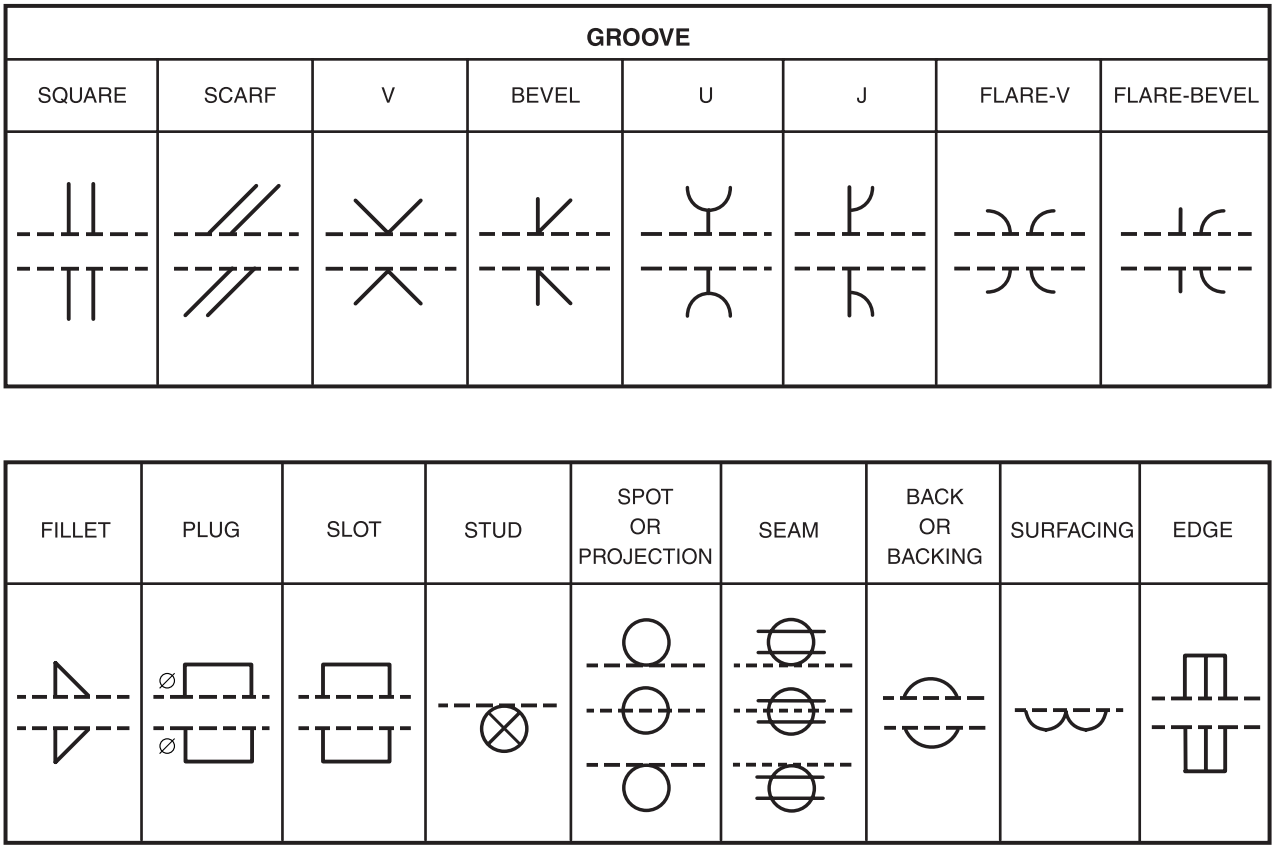
3.5 Welding Symbols. A welding symbol may consist of several elements (see Figure 3). Only the reference line and the arrow are required elements. Additional elements may be included to convey specific welding information. Alternatively, welding information may be conveyed by other means such as by drawing notes or details, specifications, standards, codes, or other drawings, which eliminates the need to include the corresponding elements in the welding symbol.

The tail of the symbol is used for designating the welding, brazing, and cutting process as well as the welding or brazing specifications, procedures, or the supplementary information to be used in making the weld or braze. The process; identification of the filler metal that is to be used; whether peening, backgouging, or other operations are required; and other pertinent data should be known. The notation to be placed in the tail of the symbol indicating these data is usually established by the user.

All elements, when used, shall have specific locations within the welding symbol as shown in Figure 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.

3.6 Placement of the Welding Symbol. 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.

3.7 Illustrations. The examples given, including the dimensions, are illustrative only and are intended to demonstrate the proper application of drafting practices. They are not intended to represent design practices or to replace code or specification requirements.



NOTE: The reference line is shown as a dashed line for illustrative purposes.

Figure 1—Weld Symbols

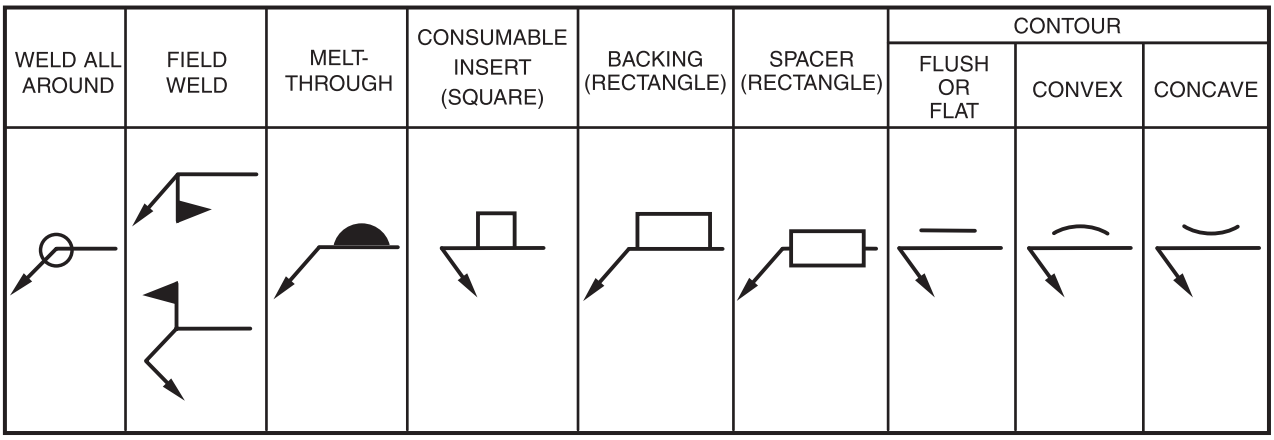


Figure 2—Supplementary Symbols

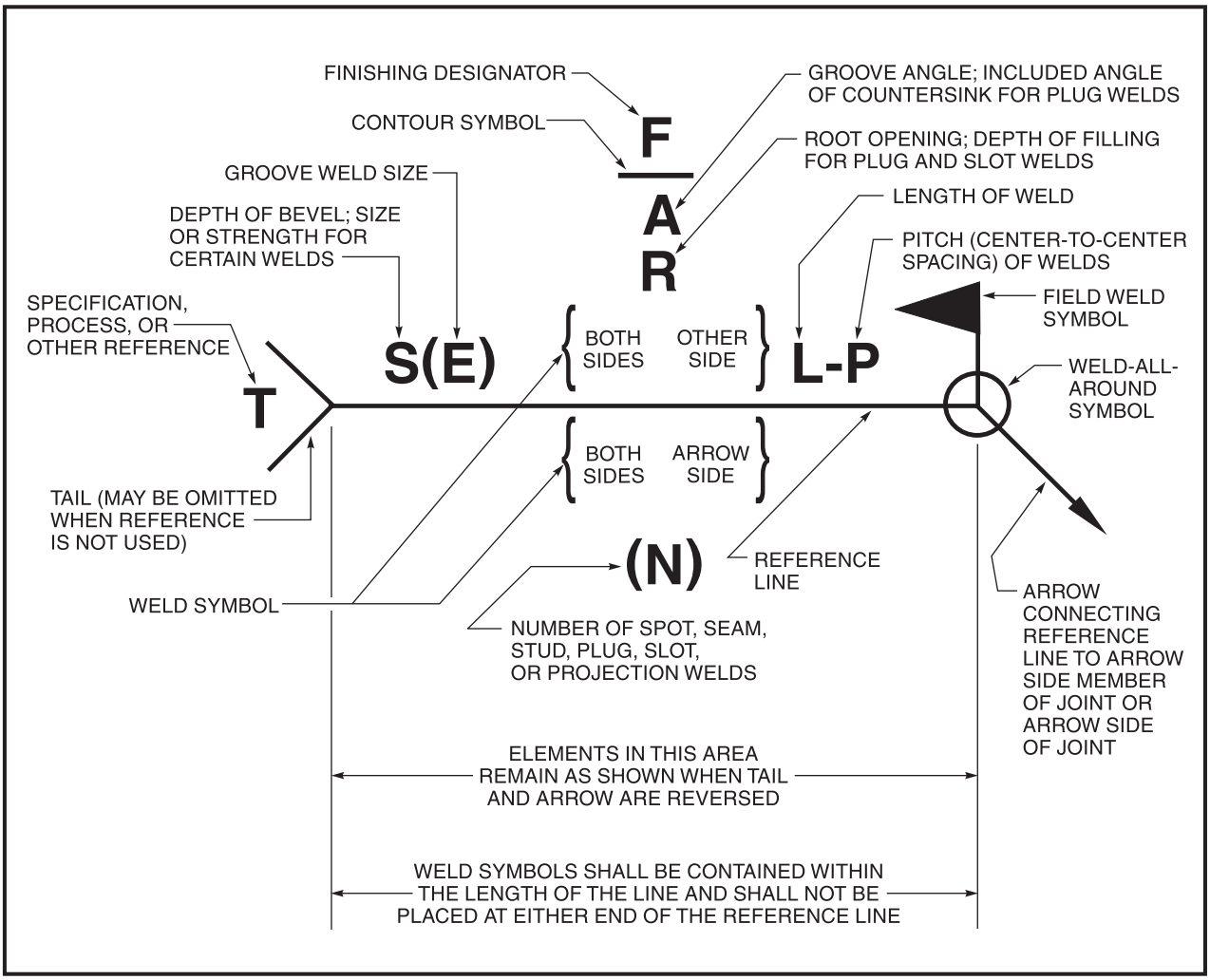


Figure 3—Standard Location of the Elements of a Welding Symbol

4. Joint Types

The basic welding joint types—butt, corner, T-, lap, and edge—are shown in Figure 4. Joint type designators are shown in Annex A, Table A.1.

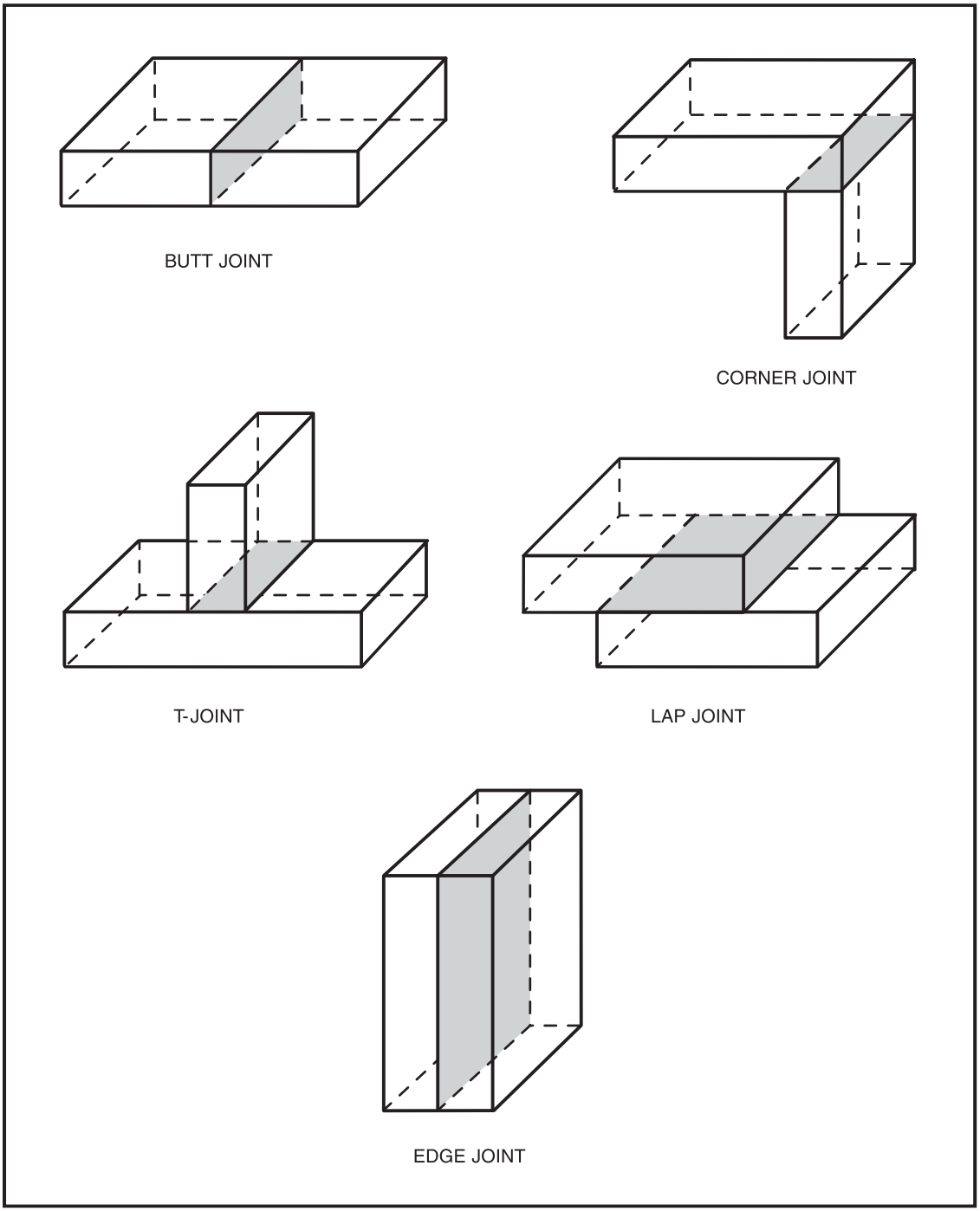
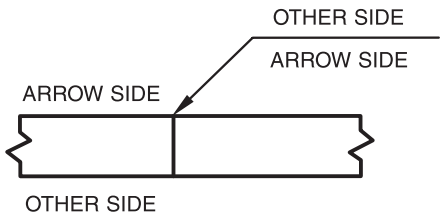


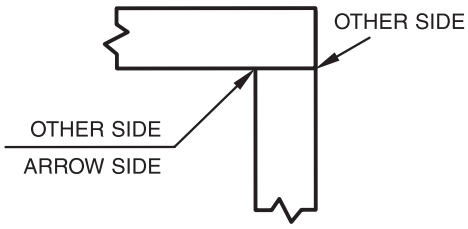
Figure 4—Joint Types

5. General Provisions for Welding Symbols

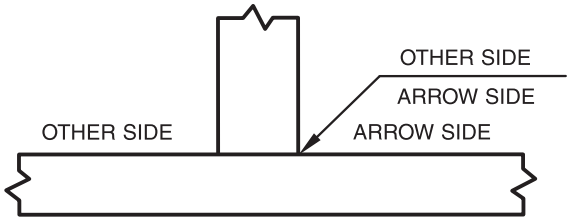
5.1 Location Significance of the Arrow. Information applicable to the arrow side of a joint shall be placed below the reference line. Information applicable to the other side of a joint shall be placed above the reference line.



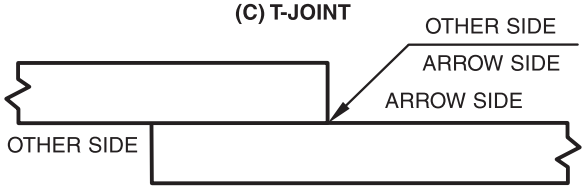
(A) BUTT JOINT



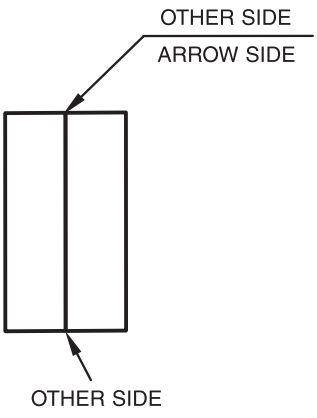
(B) CORNER JOINT



(C) T-JOINT



(D) LAP JOINT

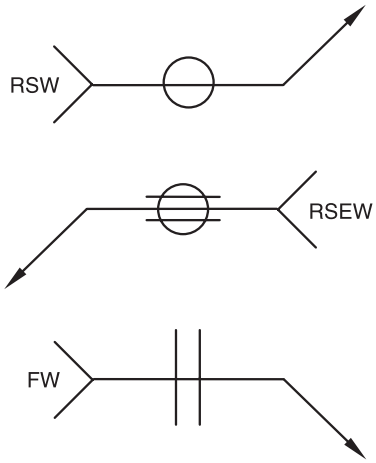


(E) EDGE JOINT

5.1.1 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 5).

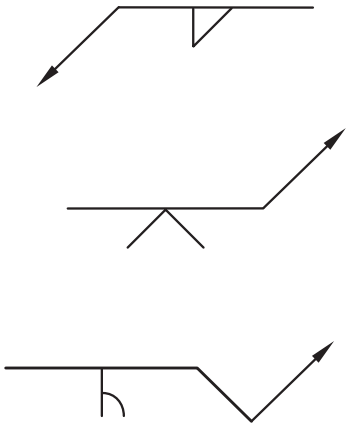
5.1.2 Plug, Slot, Spot, Projection, and Seam Weld Symbols. For these symbols, the arrow shall contact the outer surface of one of the joint members at the centerline of the desired weld. The member toward which the arrow points shall be considered the arrow-side member. The other joint member shall be considered the other-side member (see the figures cited in Clauses 8 through 11).

5.1.3 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 10.1.2 and 10.1.4).



5.2 Location of the Weld with Respect to the Joint

5.2.1 Arrow Side. Welds on the arrow side of the joint shall be specified by placing the weld symbol below the reference line (see 5.1.1).



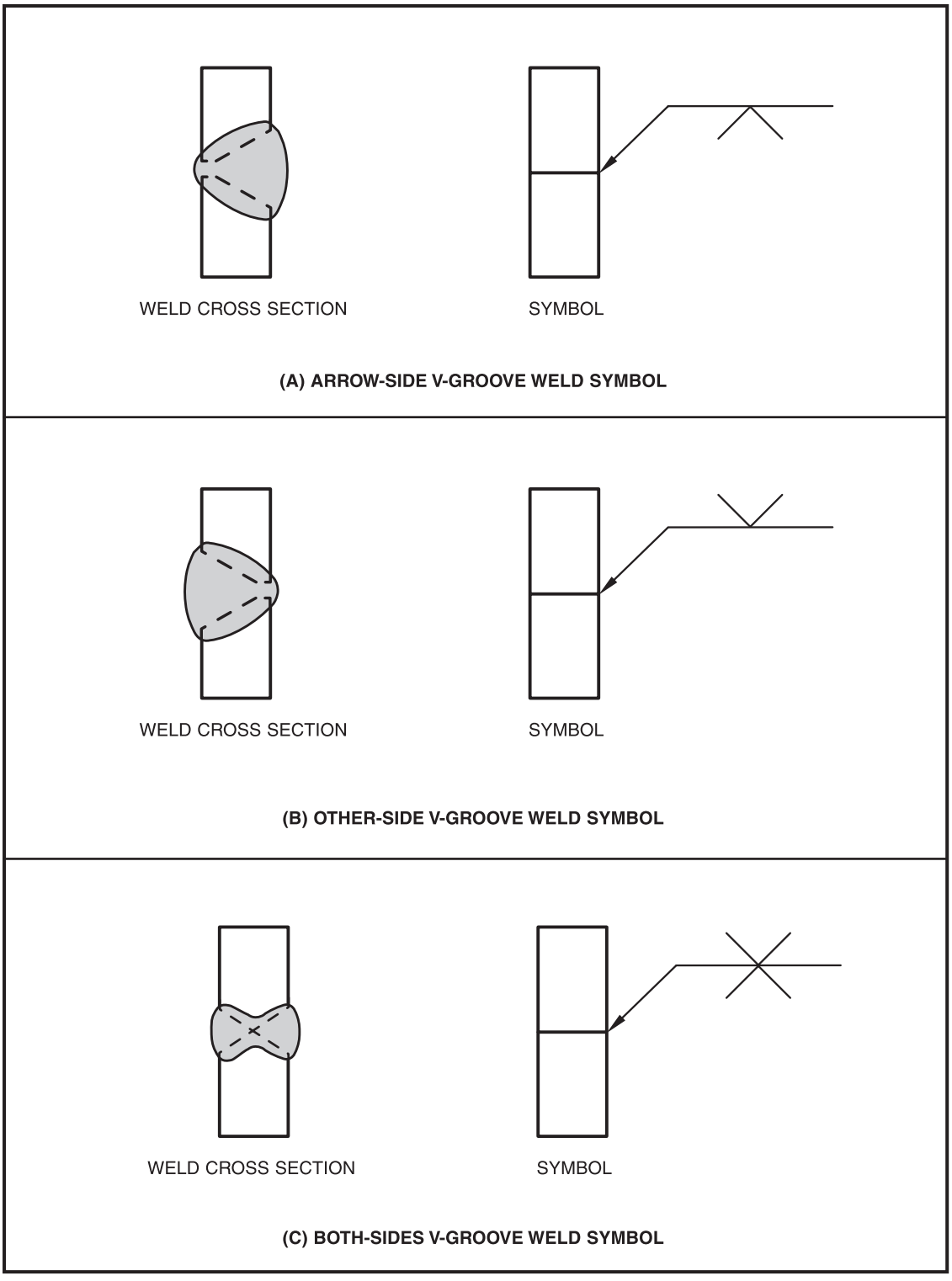
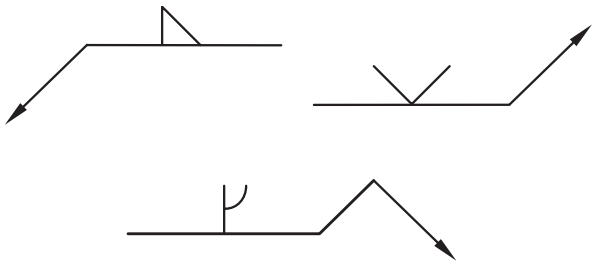


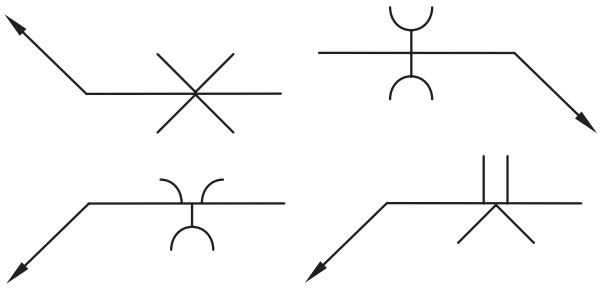
Figure 5—Application of Weld Symbols to Indicate the Arrow Side, the Other Side, and Both Sides

5.2.2 Other Side. Welds on the other side of the joint shall be specified by placing the weld symbol above the reference line (see 5.1.1).

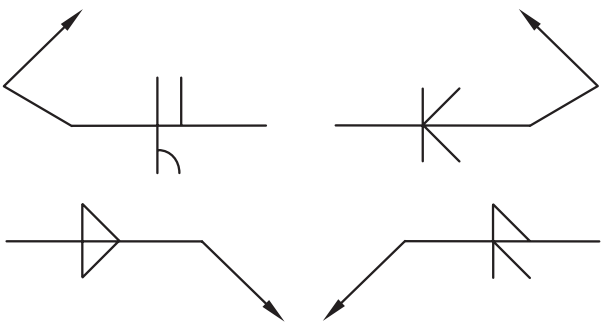


5.2.3 Both Sides. Welds on both sides of the joint shall be specified by placing weld symbols both below and above the reference line.

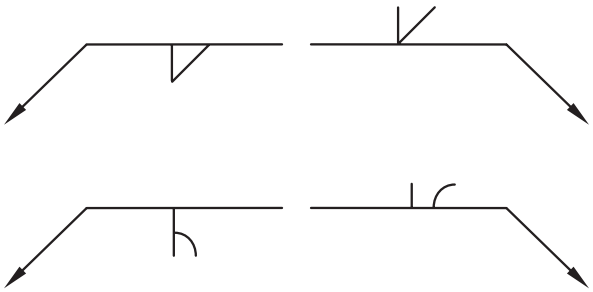
5.2.3.1 Symmetrical Weld Symbols. If the weld symbols used on both sides of the reference line have axes of symmetry that are perpendicular or normal to the reference line, these axes of the symbols shall be directly aligned across the reference line. Staggered intermittent welds are an exception.



5.2.3.2 Nonsymmetrical Weld Symbols. If either of the weld symbols used lacks an axis of symmetry perpendicular or normal to the reference line, the left sides of the weld symbols shall be directly aligned across the reference line. Staggered intermittent welds are an exception.

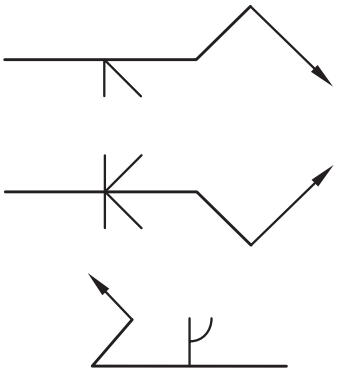


5.3 Orientation of Specific Weld Symbols. Fillet, bevel-groove, J-groove, and flare-bevel-groove weld symbols shall be drawn with the perpendicular leg always to the left.



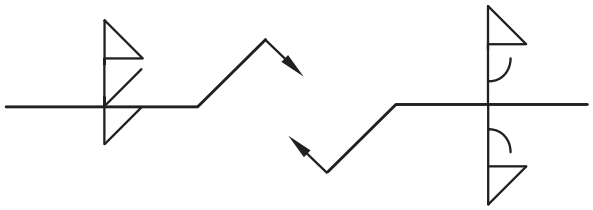
5.4 Break in the Arrow

5.4.1 Groove Welds. When only one joint member is to have a bevel-groove or a J-groove or both, the arrow shall have one break and point toward that member (see Figure 6). The arrow need not be broken if it is apparent which member is to have the bevel- or J-groove (see Figure 7). It shall not be broken if there is no preference as to which member is to have the bevel- or J-groove. A broken arrow need not be used for joints in which combined welds are to be specified and it is apparent which member is to be beveled.



5.4.2 Fillet Welds. The arrow may or may not be broken to indicate fillet weld locations [see Figures 9 and 33(A)].

5.5 Combination Weld Symbols. For joints requiring more than one weld type, a symbol shall be used to specify each weld (see Figure 7).



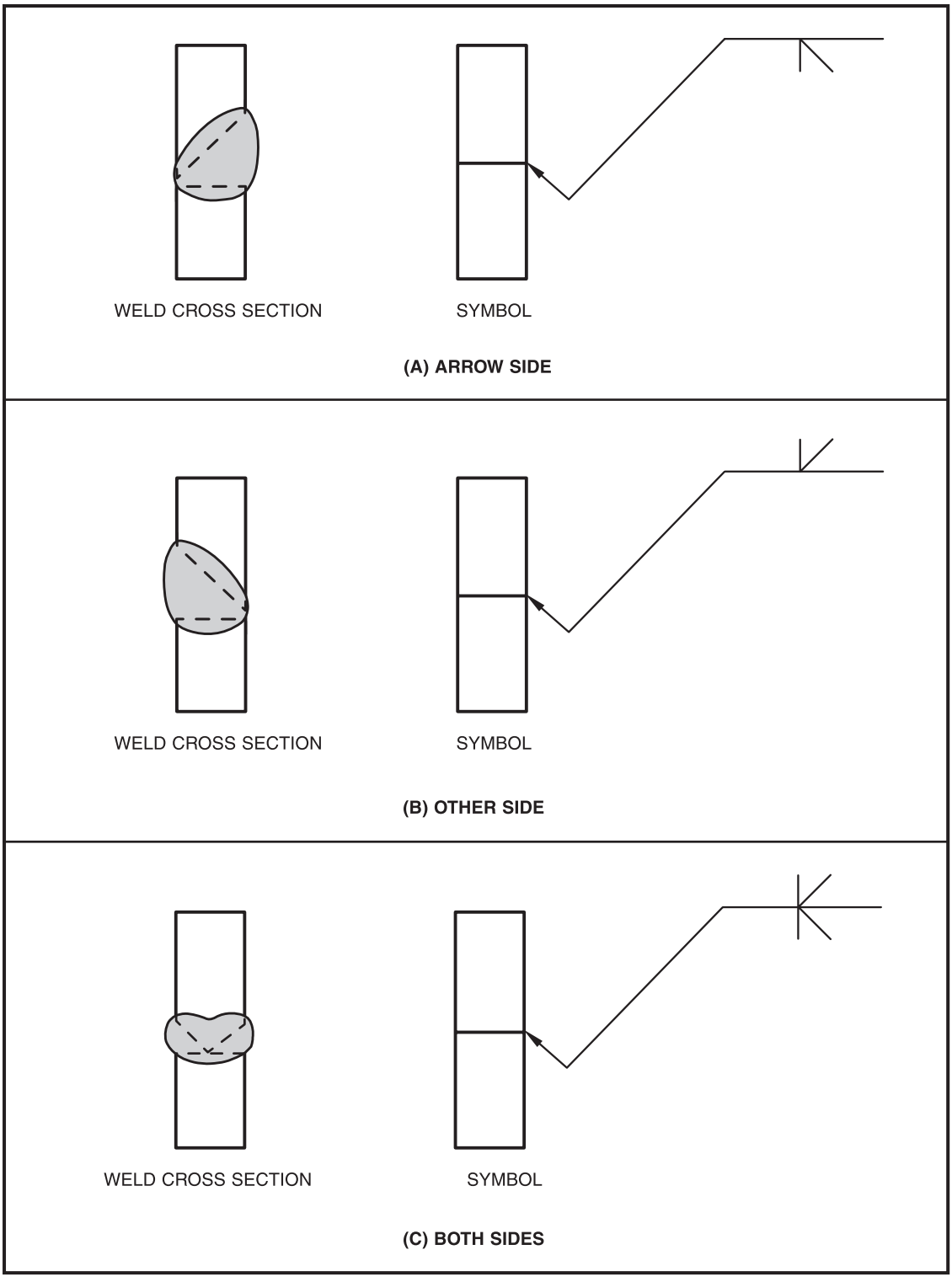


Figure 6—Applications of the Break in the Arrow of the Welding Symbol

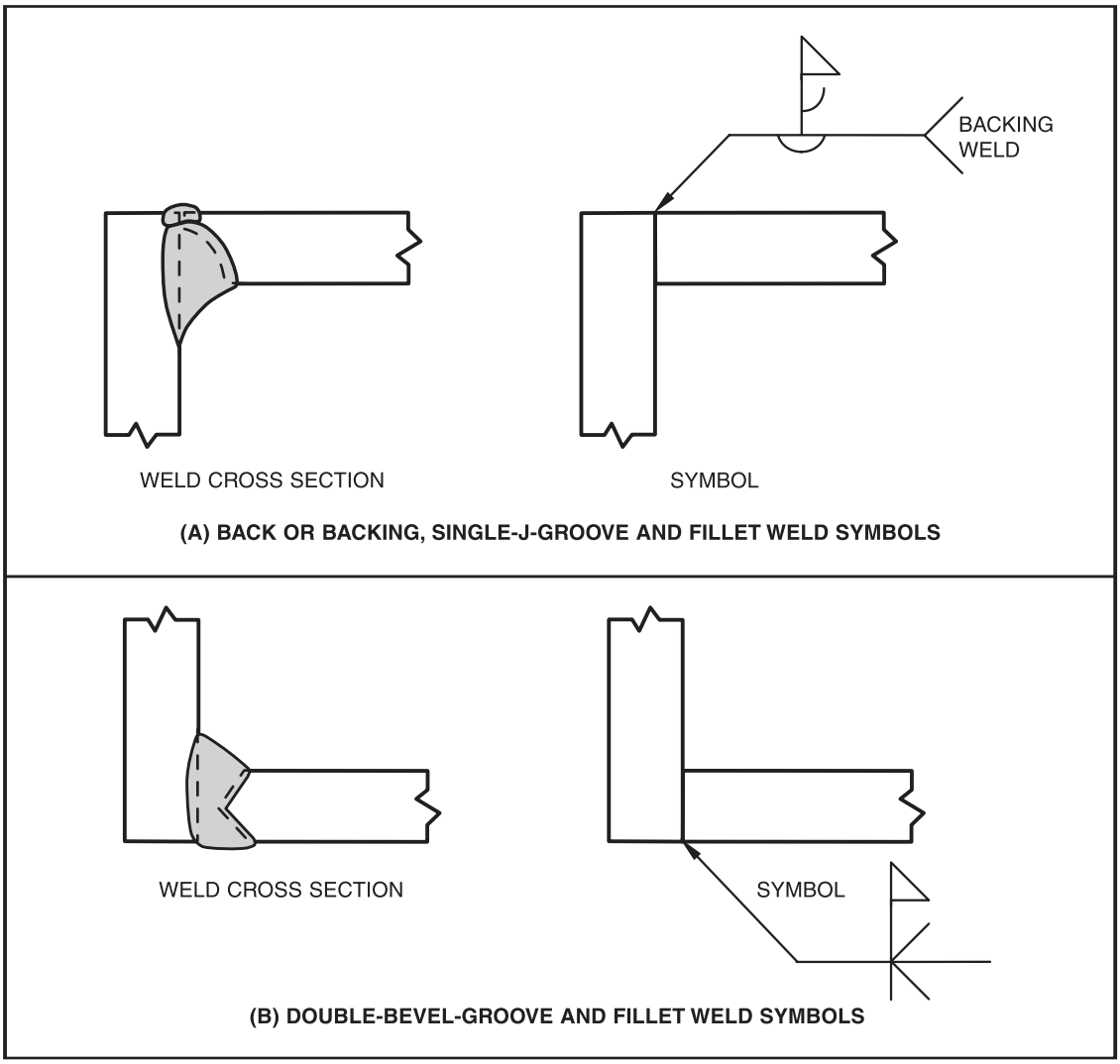


Figure 7—Combination Weld Symbols

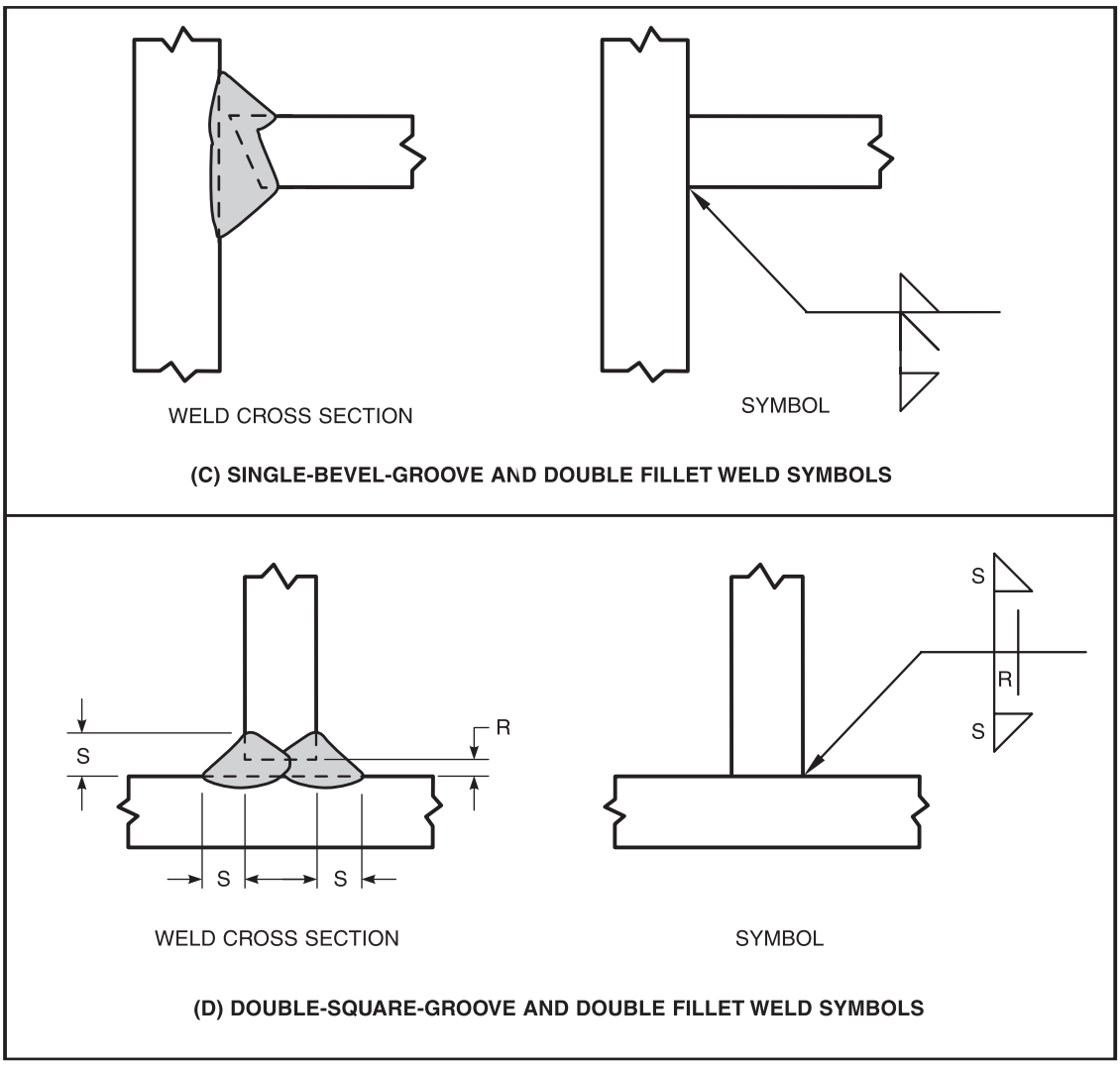
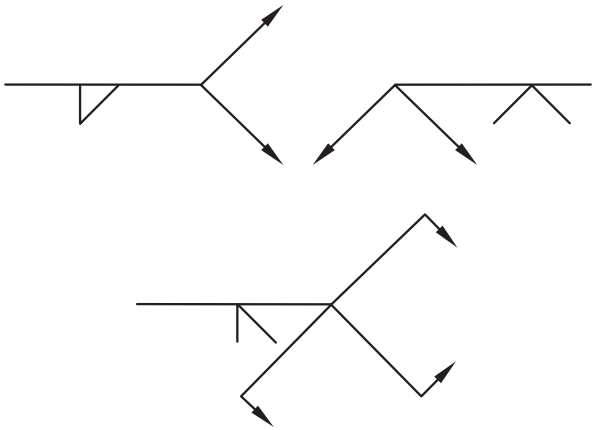


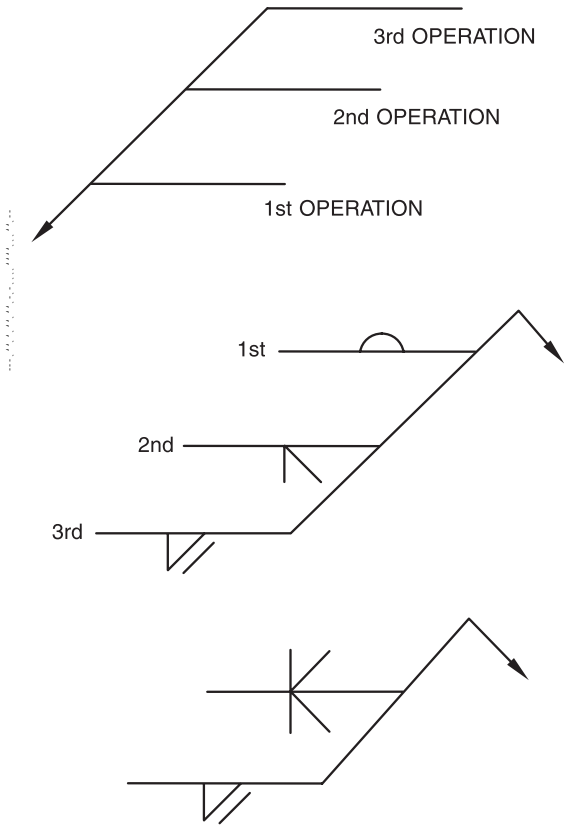
Figure 7 (Continued)—Combination Weld Symbols

5.6 Multiple Arrow Lines. Two or more arrows may be used with a single reference line to point to locations where identical welds are specified [see Figures 9(A) and 10].

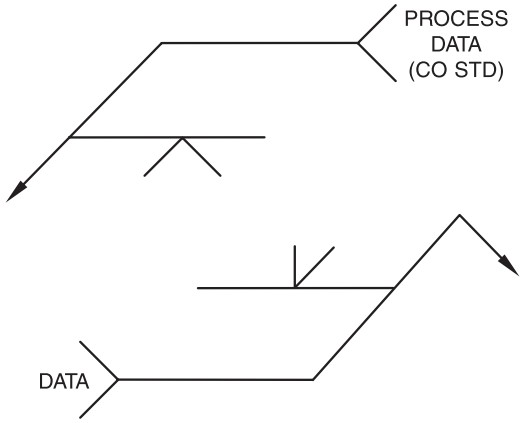


5.7 Multiple Reference Lines

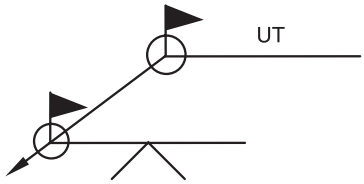
5.7.1 Sequence of Operations. Two or more reference lines may be used to indicate a sequence of operations. The first operation is specified on the reference line nearest the arrow. Subsequent operations are specified sequentially on additional reference lines.



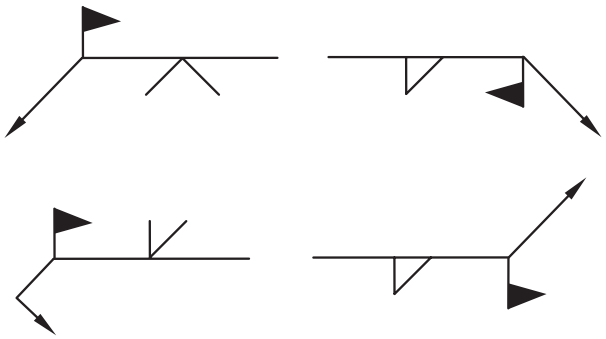
5.7.2 Supplementary Data. The tail of additional reference lines may be used to specify data supplementary to welding symbol information.



5.7.3 Field Weld and Weld-All-Around Symbols. When required, the weld- (or examine-) all-around symbol shall be placed at the junction of the arrow and the reference line for each operation to which it is applicable. The field weld symbol may also be applied to the same location.



5.8 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 D5.8).



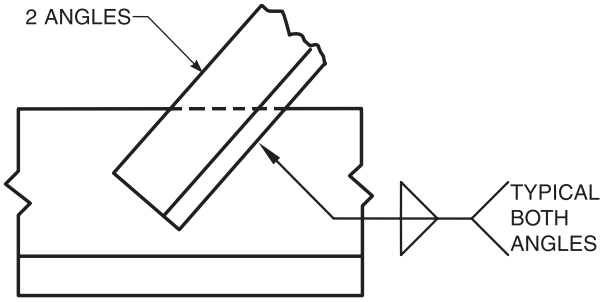
5.9 Extent of Welding Denoted by Symbols

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

5.9.2 Changes in the Direction of Welding. Welding symbols apply only between any changes in the direction of welding or to the extent of hatching or dimension lines (see Figure 8), except when the weld-all-around symbol is used [see Figure 9(B), (C), (D), and (E)].

Additional welding symbols or multiple arrows shall be used to specify the welds required for any 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 9(A)] or from the first reference line in the case of a multiple reference line symbol. See Annex D5.9.2 for applications involving square and rectangular tubing.

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



5.9.4 Weld Location Specified. A weld having a length less than the available joint length and whose location is significant shall have the location specified on the drawing [see Figure 8(C)].

5.9.5 Weld Location Not Specified. A weld that has a length less than the available joint length and that is not critical regarding location may be specified without indicating the location, as shown in Figure 8(D).

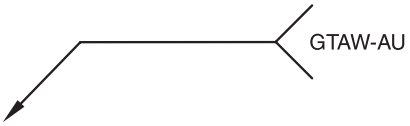
5.10 Weld-All-Around Symbol

5.10.1 Welds in Multiple Directions or Planes. A continuous weld, whether 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. 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 directions and may lie in more than one plane [see Figure 9(B), (C), (D), (E), and Annex D5.10.1].

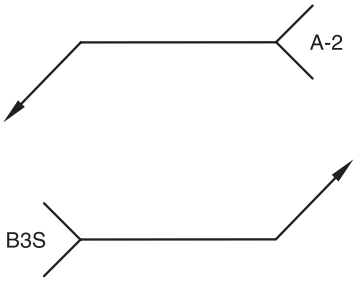
5.10.2 Circumferential Welds. Welds extending around the circumference of a pipe are excluded from the requirement regarding changes in direction and do not require the weld-all-around symbol to specify a continuous weld.

5.11 Tail of the Welding Symbol

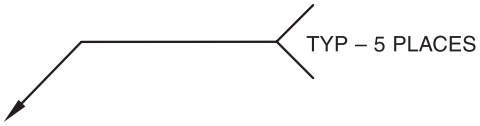
5.11.1 Welding and Allied Process Specification. The welding and allied process to be used may be specified by placing the appropriate letter designations from Annex A, Table A.2, Table A.3, or Table A.4 in the tail of the welding symbol. An auxiliary suffix from Table A.5 may be used.



5.11.2 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.



5.11.3 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 10). The user shall provide additional information to completely identify all applicable joints (see Annex D5.11.3).



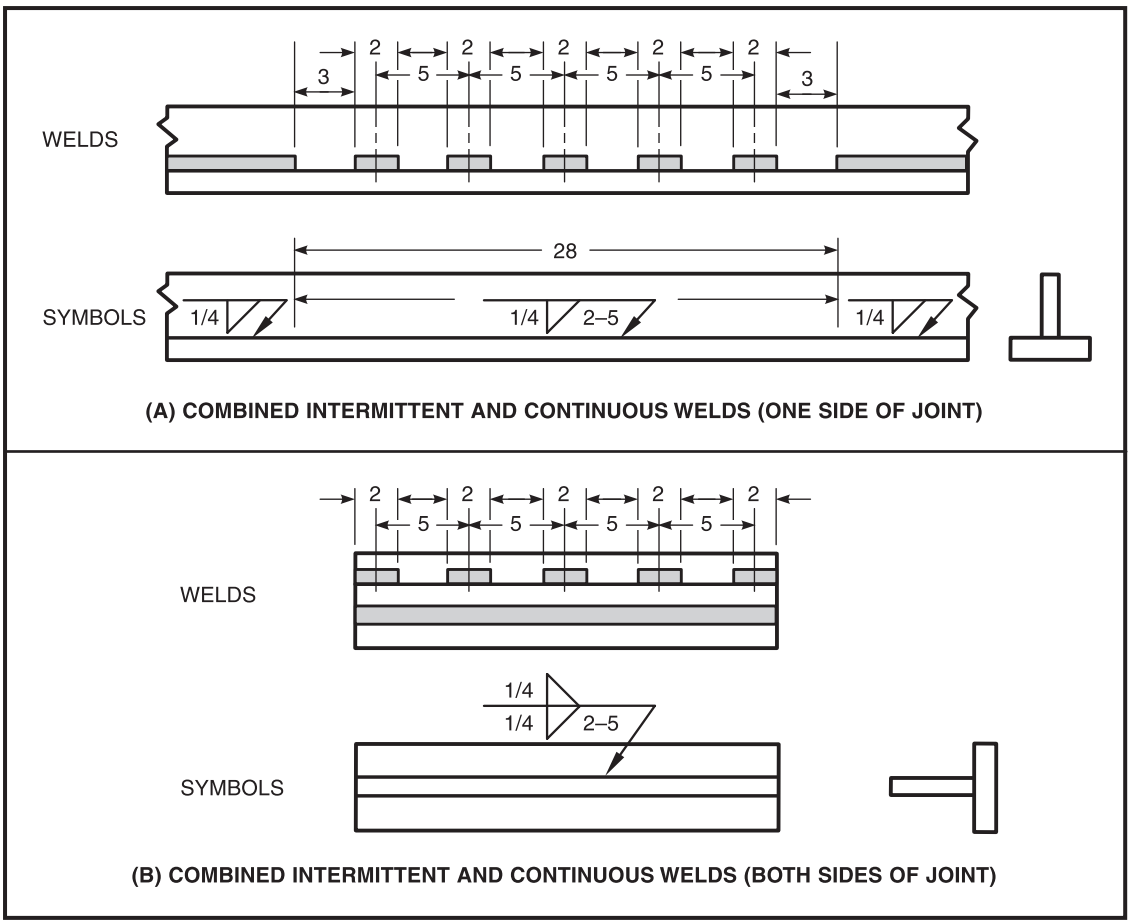


Figure 8—Specification of the Location and Extent of Fillet Welds

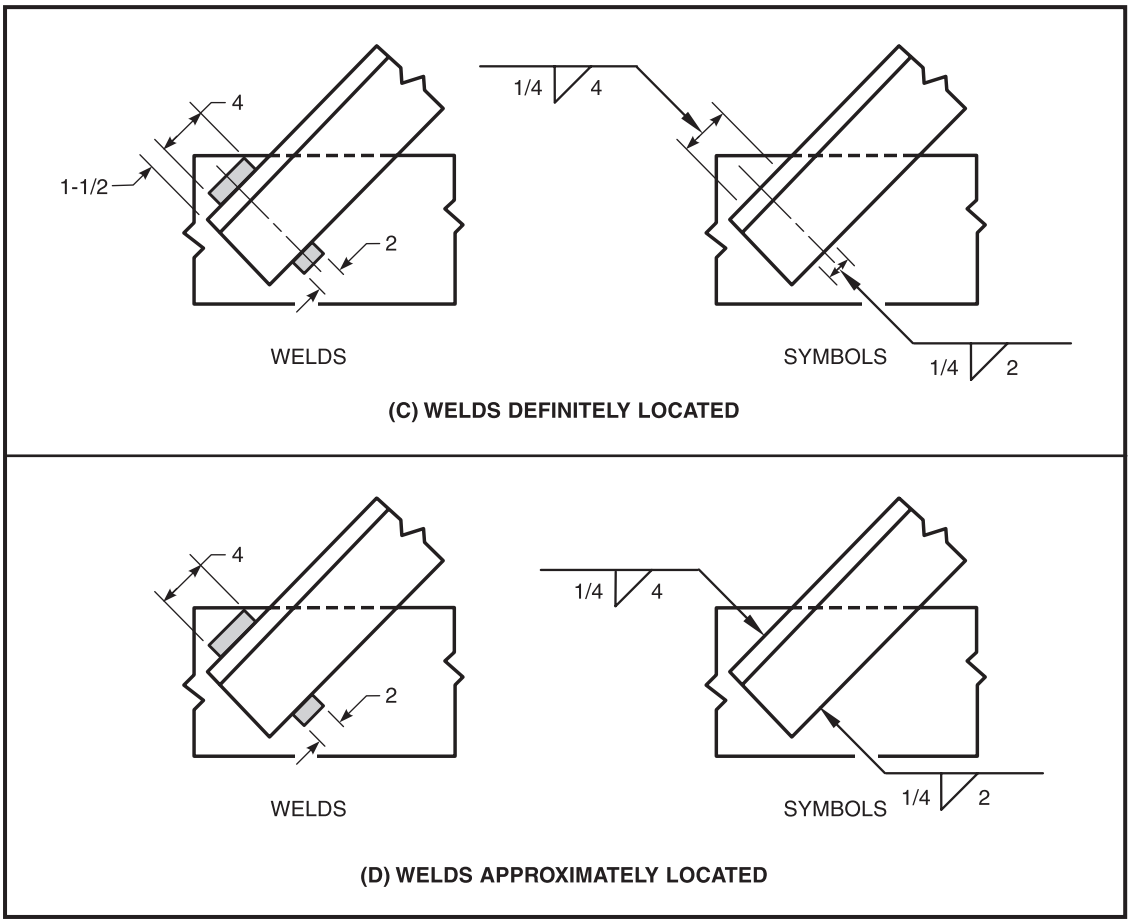


Figure 8 (Continued)—Specification of the Location and Extent of Fillet Welds

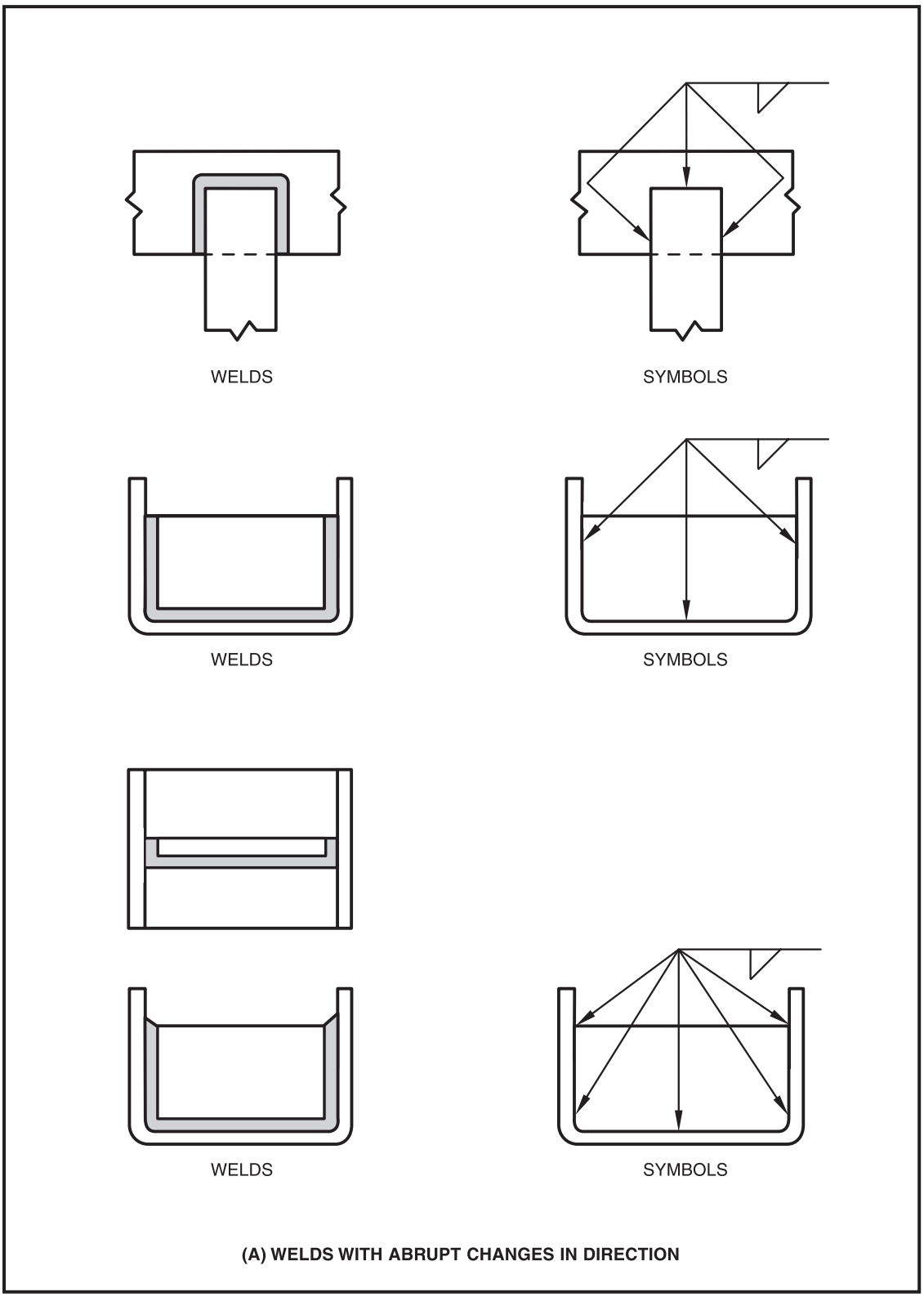


Figure 9—Application of the Symbol for the Specification of the Extent of Welding

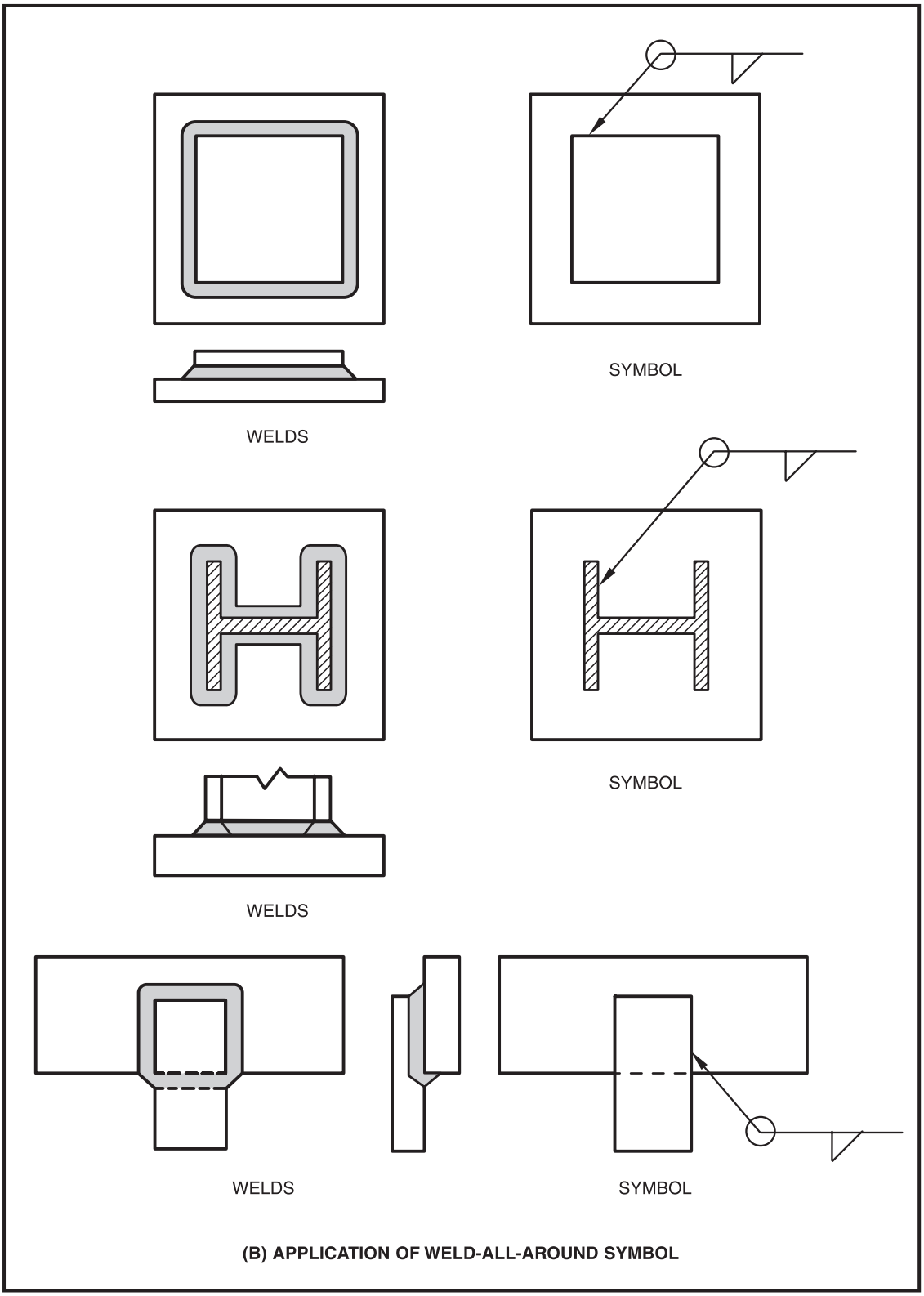


Figure 9 (Continued)—Application of the Symbol for the Specification of the Extent of Welding

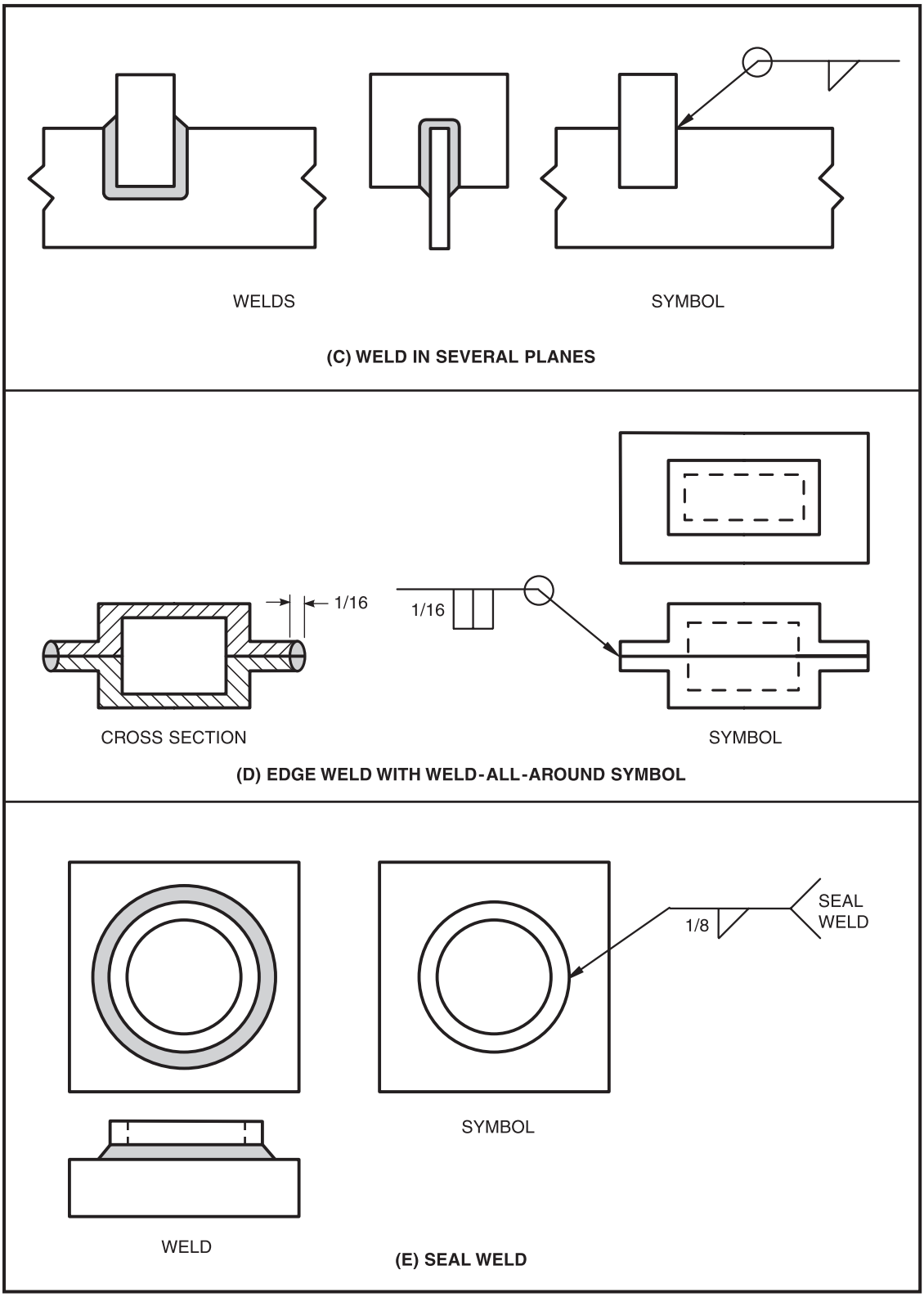


Figure 9 (Continued)—Application of the Symbol for the Specification of the Extent of Welding

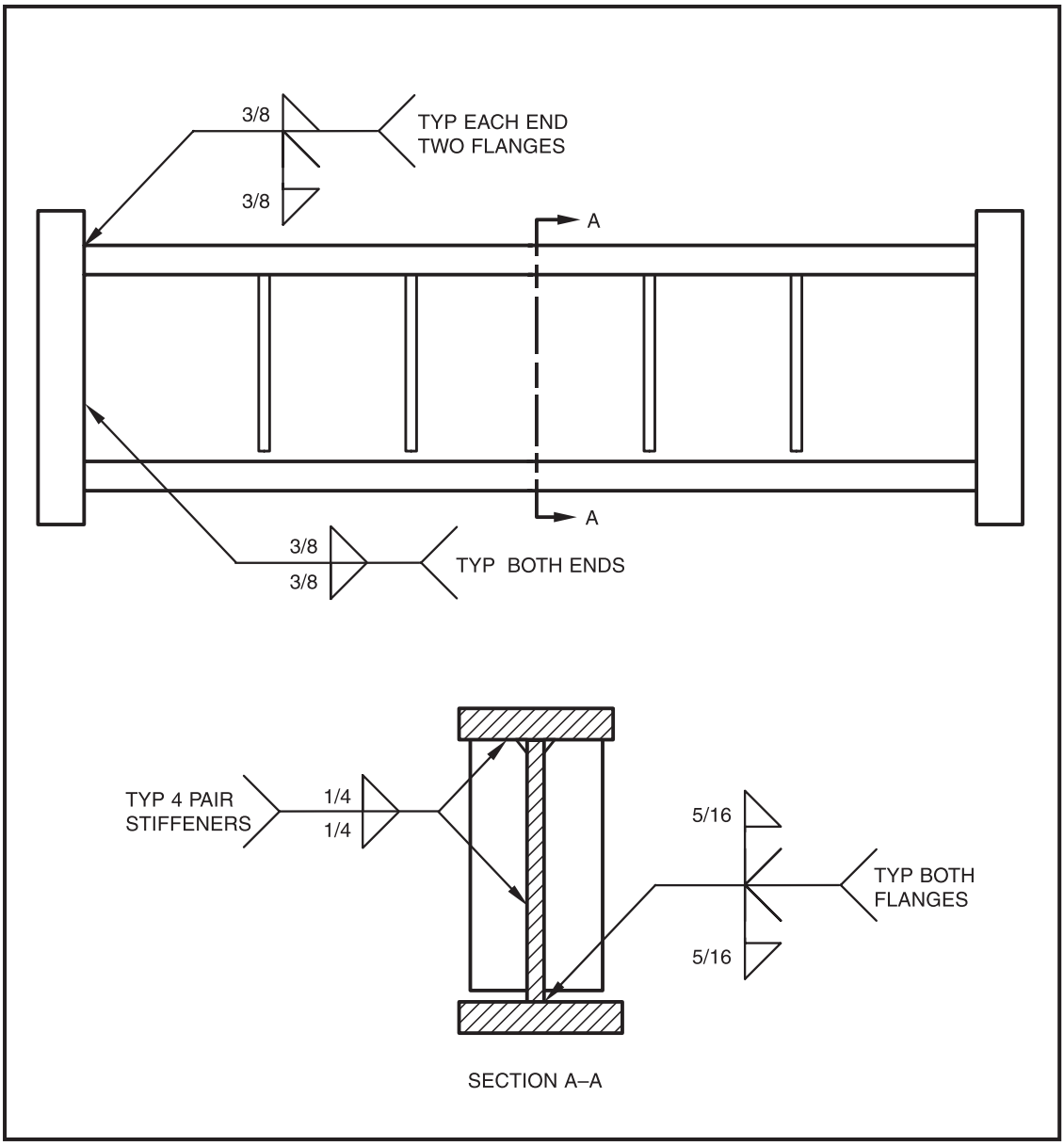
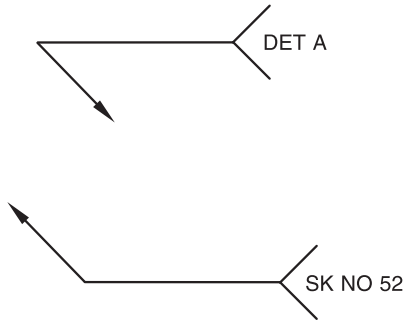
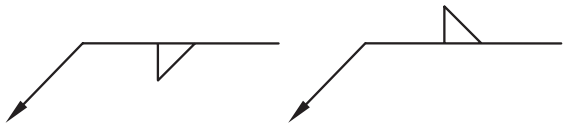


Figure 10—Application of the "TYPICAL" Welding Symbol

5.11.4 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 6.13 and 7.7).



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

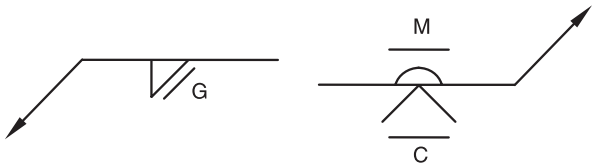


5.11.6 Drawing Notes. Drawing notes may be used to provide information pertaining to the welds. Such information need not be repeated in the welding symbols.

5.12 Contour Symbols

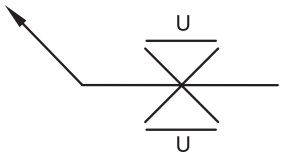
5.12.1 Contours Obtained by Welding. Welds to be made with approximately flush, flat, convex, or concave contours without the use of mechanical finishing shall be specified by adding the flush, flat, convex, or concave symbol to the welding symbol. Finishing designators are not to be used when the required weld contour is to be obtained by welding.

5.12.2 Contours Obtained by Postweld Finishing. Finishing designators are not to be used to specify the degree of finish.



C = CHIPPING
G = GRINDING
H = HAMMERING
M = MACHINING
P = PLANISHING
R = ROLLING
U = UNSPECIFIED

5.12.3 Symbol for Finishing Method Unspecified. Welds to be finished approximately flush, flat, convex, or concave with the method unspecified shall be indicated by adding the letter "U" to the appropriate contour symbol.



5.13 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 11).

5.13.1 Melt-Through Symbol Location. The melt-through symbol shall be placed on the side of the reference line opposite the weld symbol (see Figure 11).

5.13.2 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 11). The height of the root reinforcement may be unspecified.

5.14 Melt-Through with Edge Welds

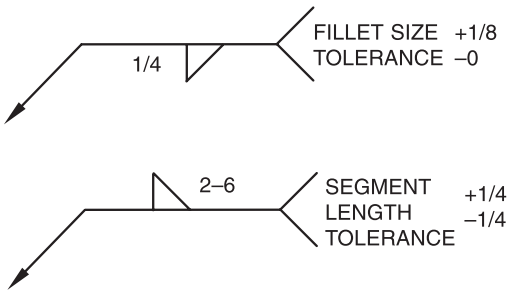
5.14.1 Melt-Through with Edge Welds on Flanged Butt Joints. Edge welds requiring complete joint penetration shall be specified by the edge weld symbol with the melt-through symbol placed on the opposite side of the reference line. The details of the flanges are considered part of the drawing and are not specified by the welding symbol [see Figure 11(D)].

5.14.2 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 11(E)].

5.15 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.

5.16 U.S. Customary and SI Units. The same system that is the standard 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, a table of conversions may be included on the drawing. For guidance on drafting standards, refer to ANSI Y14 Series, *Drafting Manual Series.* For guidance on the use of SI Units, refer to AWS A1.1, *Metric Practice Guide for the Welding Industry*.

5.17 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, a table, code, or specification. In all cases, a reference must be made to the dimension to which the tolerance applies.



5.18 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 D5.18).

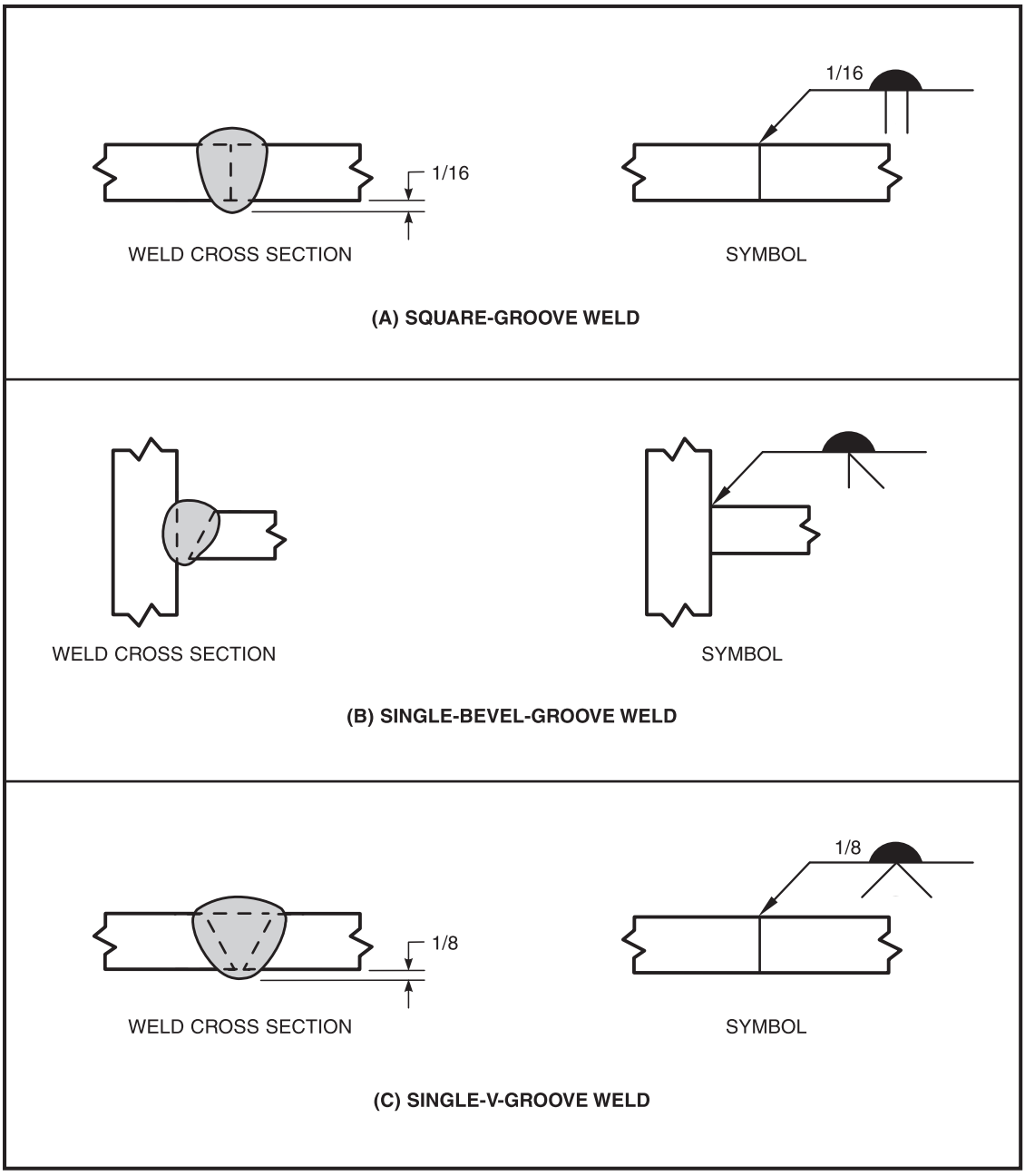


Figure 11—Application of the Melt-Through Symbol

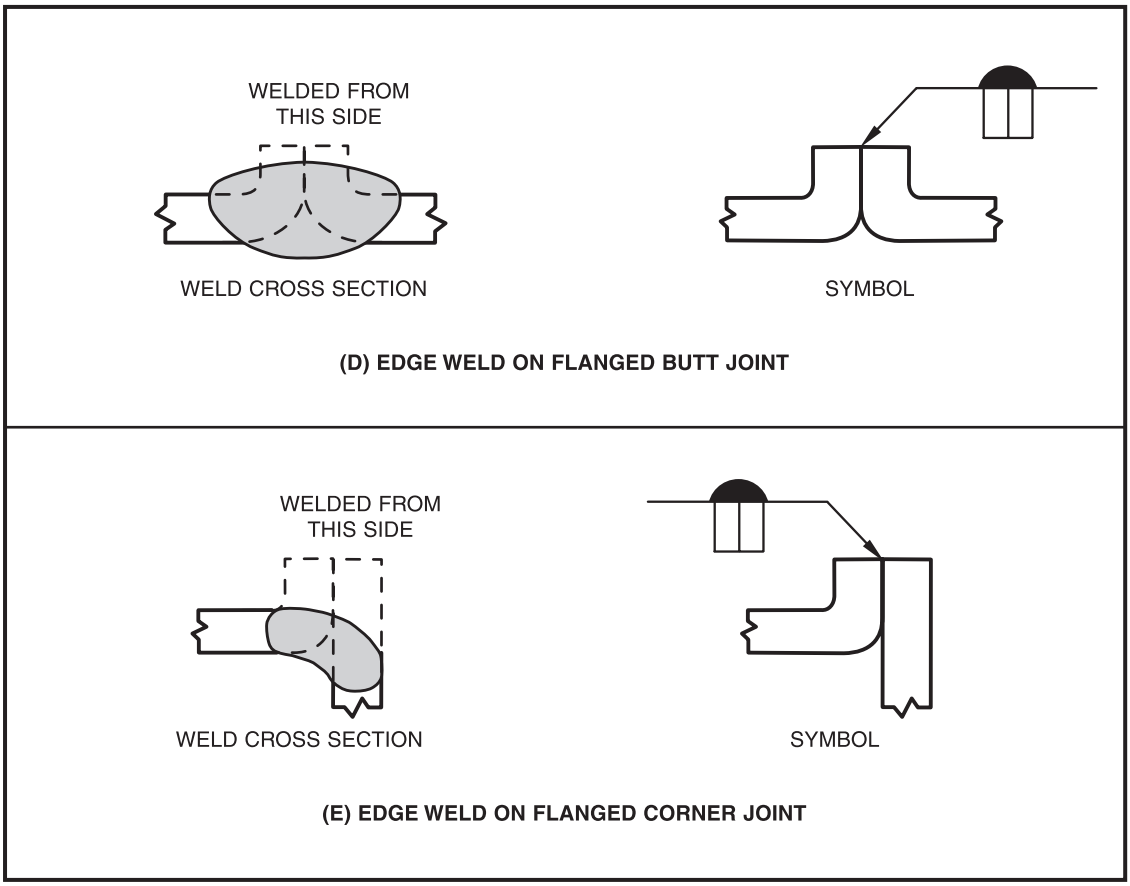
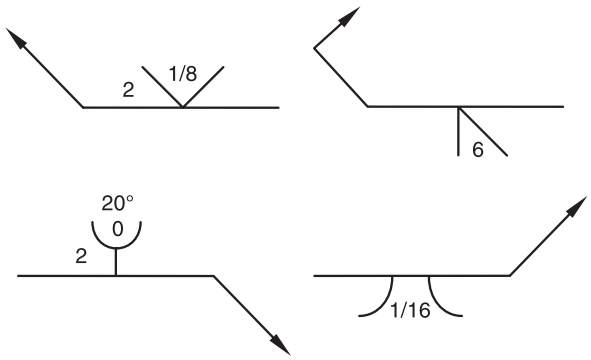


Figure 11 (Continued)—Application of the Melt-Through Symbol

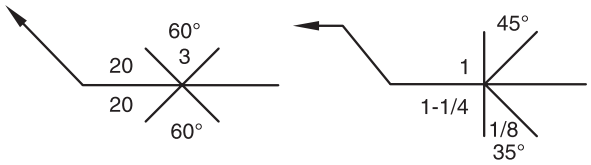
6. Groove Welds

6.1 General

6.1.1 Single-Groove Dimensions. Groove weld dimensions shall be specified on the same side of the reference line as the weld symbol [see Figure 12(A) and (F)].

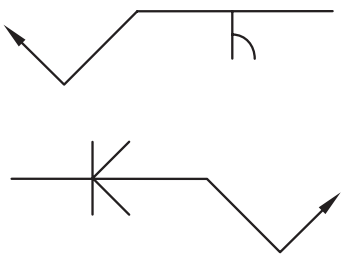


6.1.2 Double-Groove Dimensions. Each groove of a double-groove joint shall be dimensioned; however, the root opening need appear only once (see Figure 13).

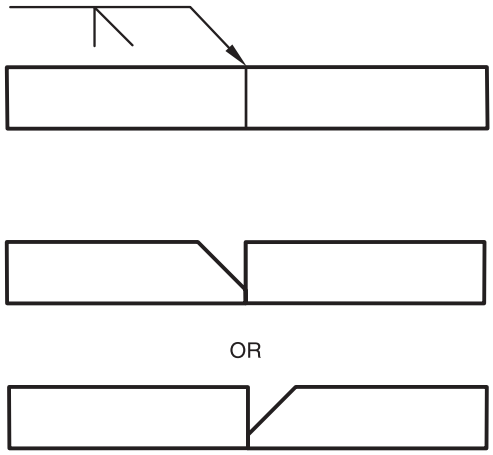


6.1.3 Broken Arrow and the Straight Arrow

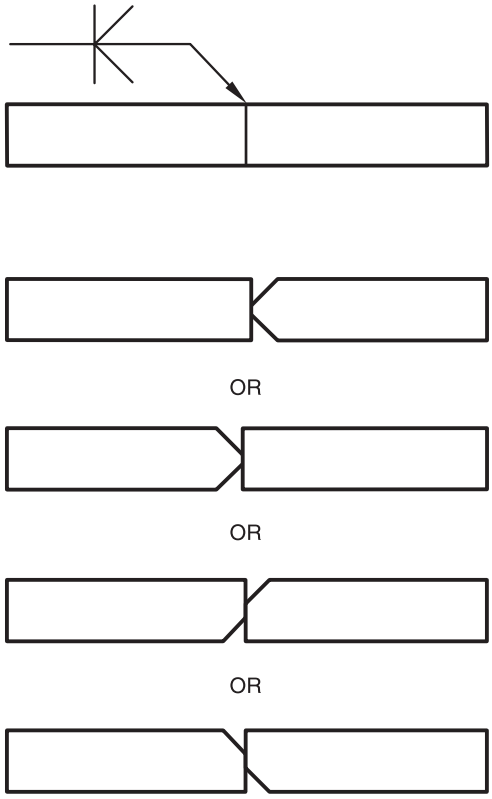
6.1.3.1 Broken Arrow. A broken arrow is used, when necessary, to specify which member is to have a bevel- or J-groove edge shape for single- or double-bevel and single- or double-J-groove welds (see 5.4.1).



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



6.1.3.3 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- or double-J-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.



6.2 Depth of Bevel and Groove Weld Size

6.2.1 Location. When used, the depth of bevel, "S," and groove weld size, "(E)," shall be placed to the left of the weld symbol [see Figure 12(A), (B), (C), and (F) and Figures 13 through 15].

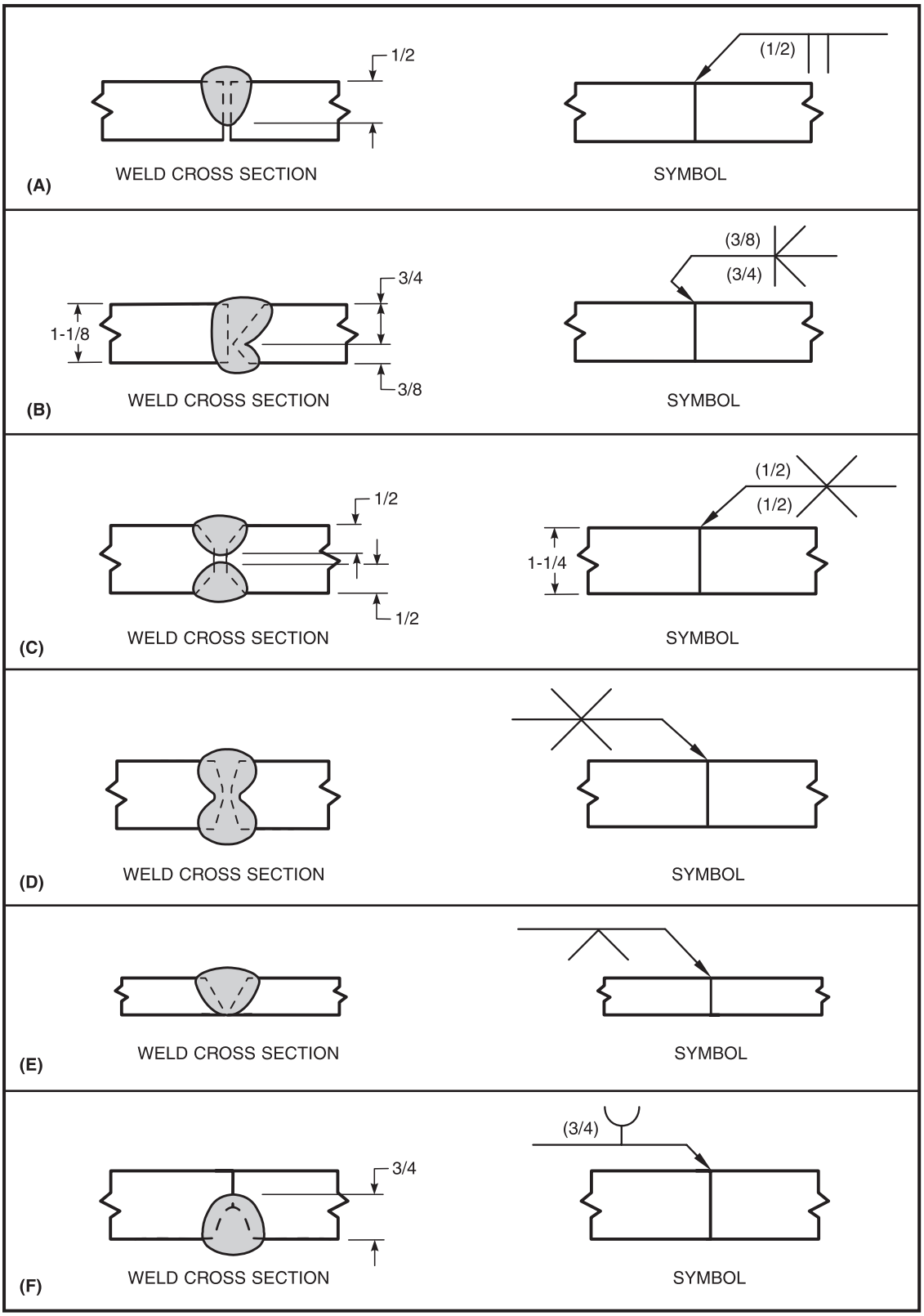


Figure 12—Specification of Groove Weld Size, Depth of Bevel Not Specified

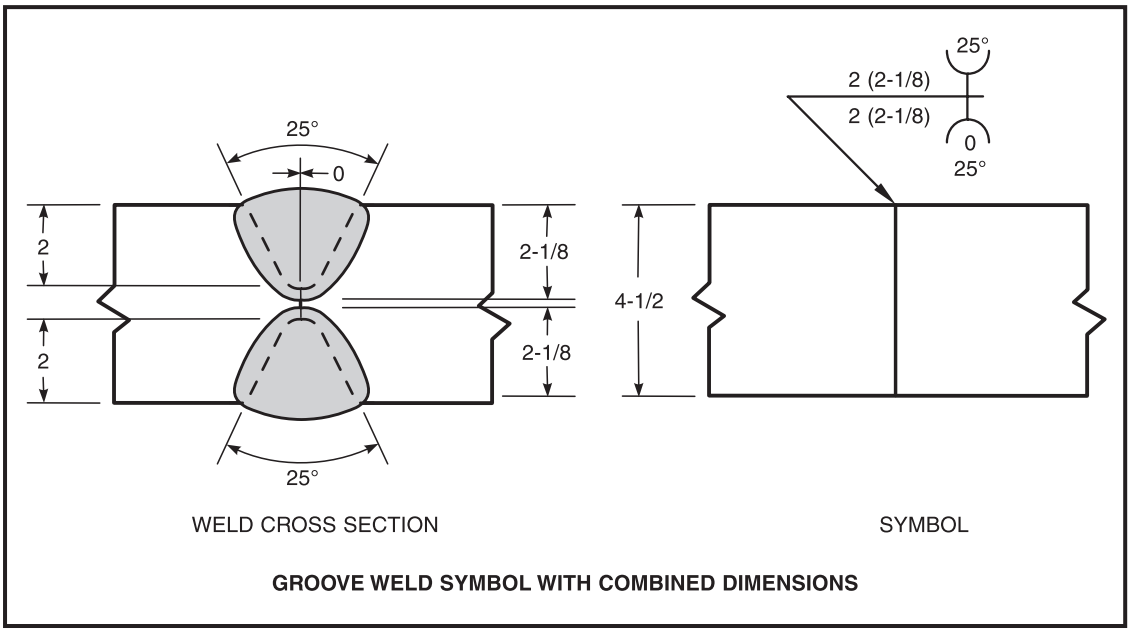


Figure 13—Application of Dimensions to the Groove Weld Symbol

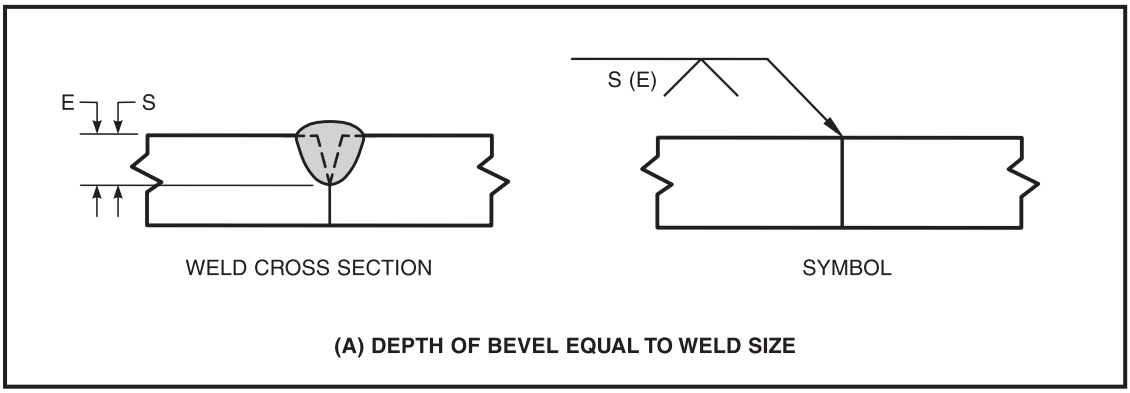


Figure 14—Groove Weld Size, (E), Related to Depth of Bevel, S

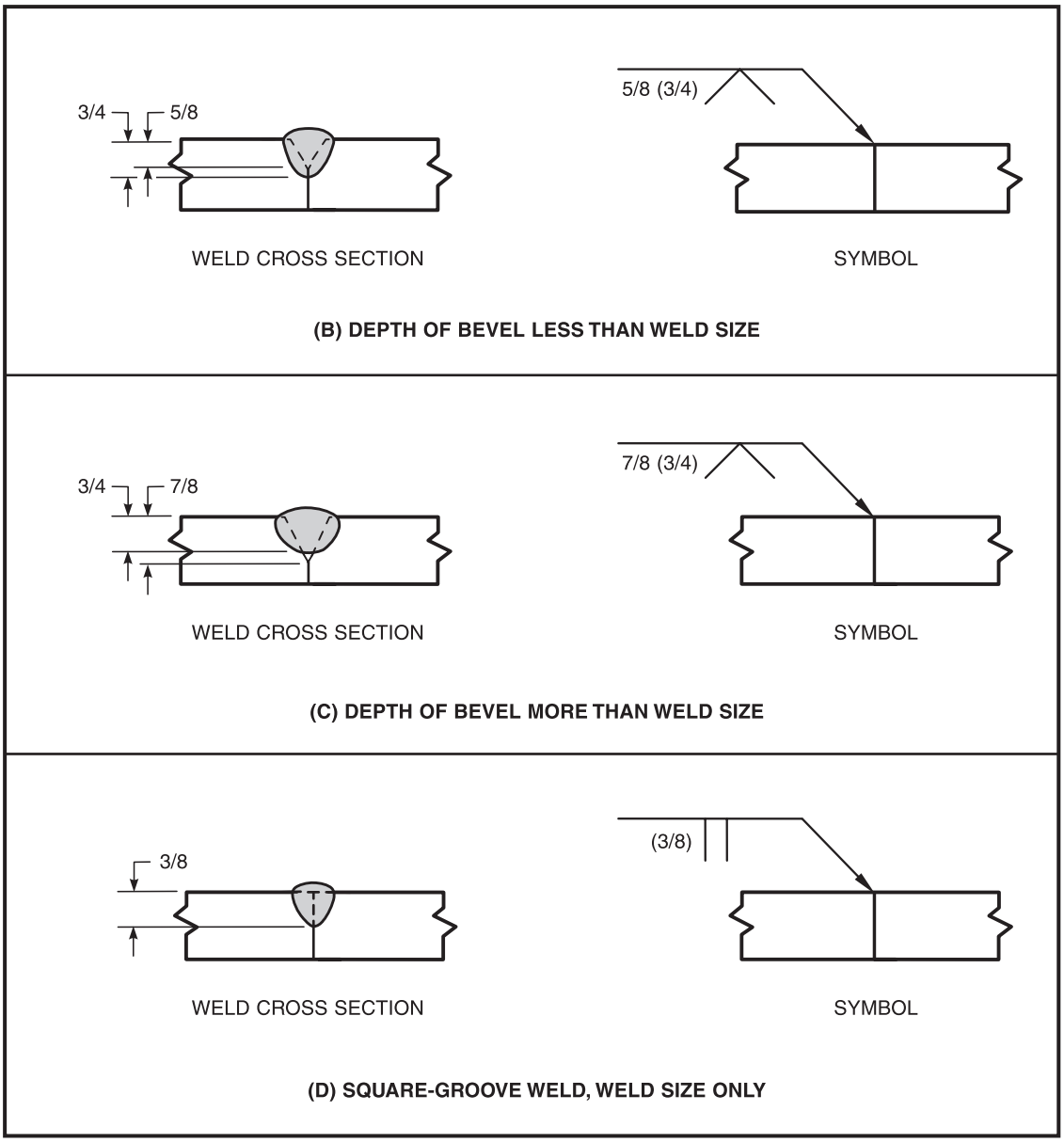


Figure 14 (Continued)—Groove Weld Size, (E), Related to Depth of Bevel, S

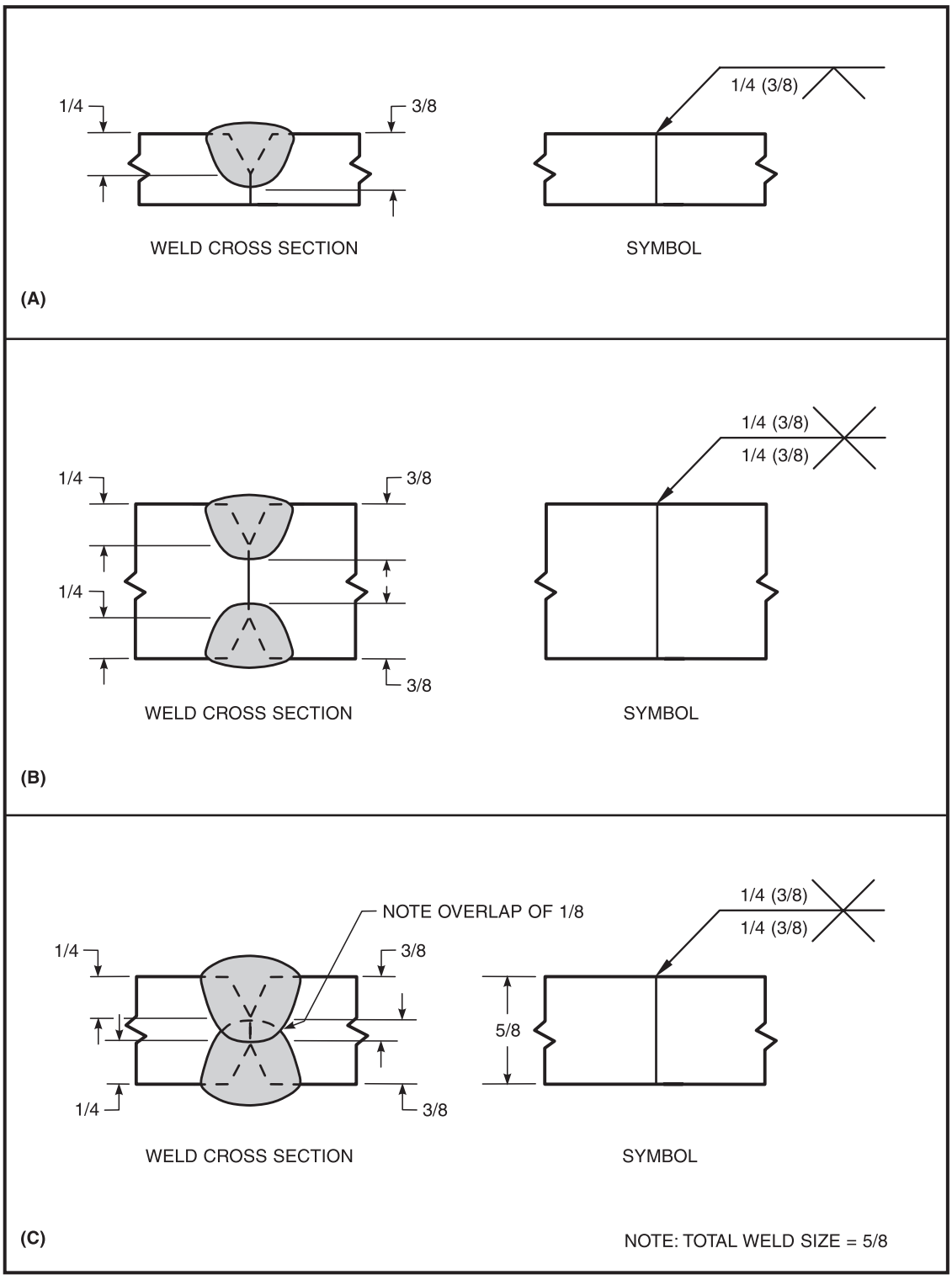
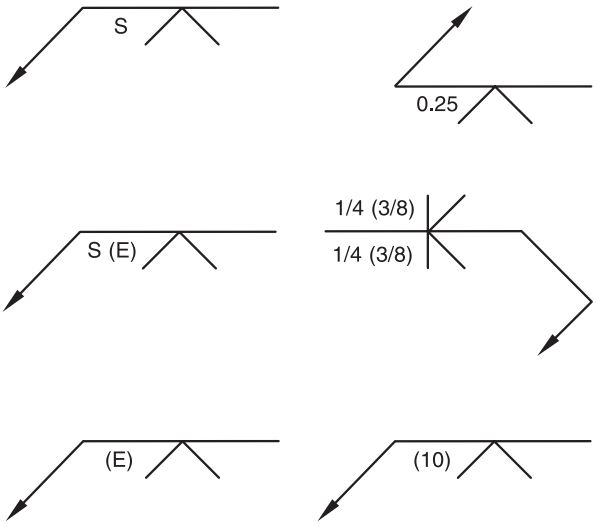
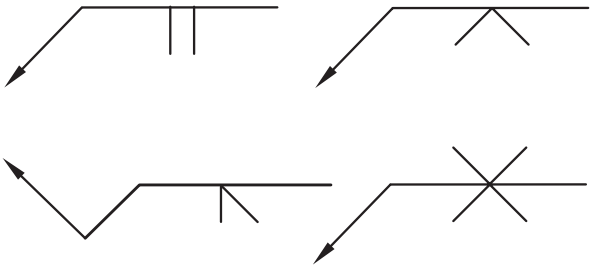


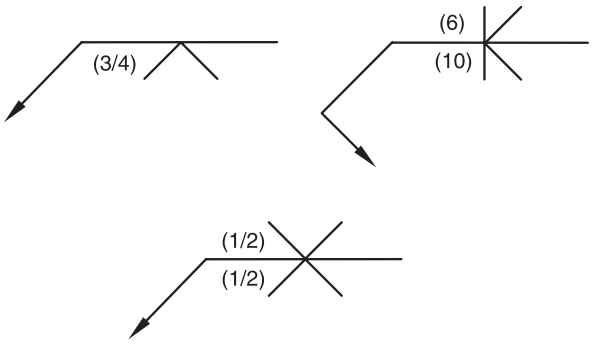
Figure 15—Specification of a Groove Weld and Depth of Bevel



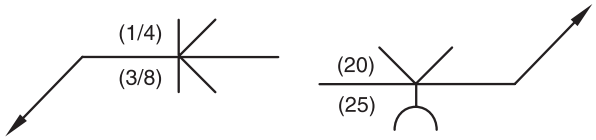
6.2.2 Complete Joint Penetration. Omitting the depth of bevel and groove weld size dimensions from the welding symbol requires a groove weld that extends through the thickness of the joint [see Figure 12(D) and (E), Figures 18 and 19, as well as Annex D6.2.2].



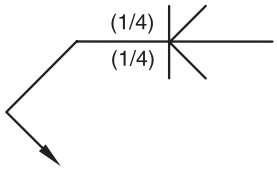
6.2.3 Partial Joint Penetration Welds, Groove Weld Size Specified, Depth of Bevel Not Specified. The size of groove welds that extend only partly through the joint shall be specified in parentheses on the welding symbol [see Figure 12(A), (C), and (F)].



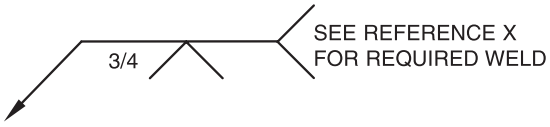
6.2.4 Complete Joint Penetration Double-Groove Welds, Weld Size Specified, Depth of Bevel Not Specified. The size of nonsymmetrical groove welds (arrow side versus other side) that extend completely through the joint shall be specified in parentheses on the welding symbol [see Figure 16(B) and (C)].



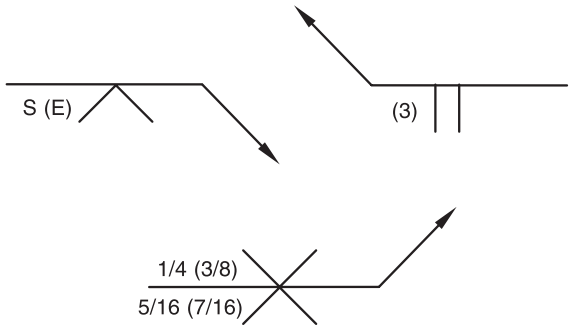
The size of symmetrical groove welds (arrow side versus other side) that extend completely through the joint may be specified in parentheses on the welding symbol [see Figure 16(A)].



6.2.5 Depth of Bevel Specified, Groove Weld Size Specified Elsewhere. A dimension not in parentheses placed to the left of a bevel-, V-, J-, or U-groove weld symbol specifies the depth of bevel only.



6.2.6 Depth of Bevel and Groove Weld Size Specified. The depth of bevel, "S," and groove weld size, "(E)," are located to the left of the weld symbol as "S(E)." For square groove welds, only the groove weld size, "(E)," is shown (see Figures 14 and 17).



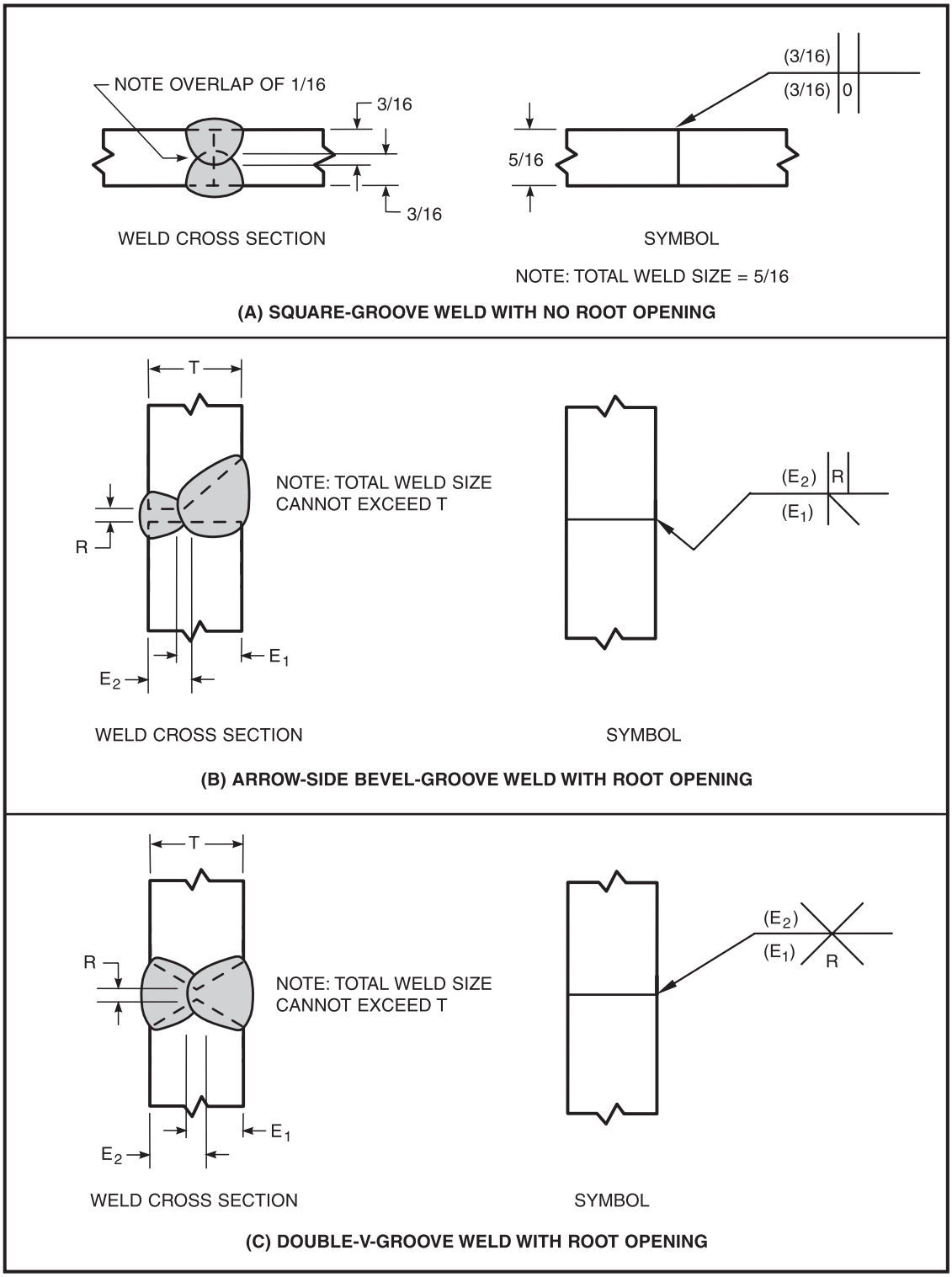


Figure 16—Application of Symbols for the Specification of Groove Weld Size Only

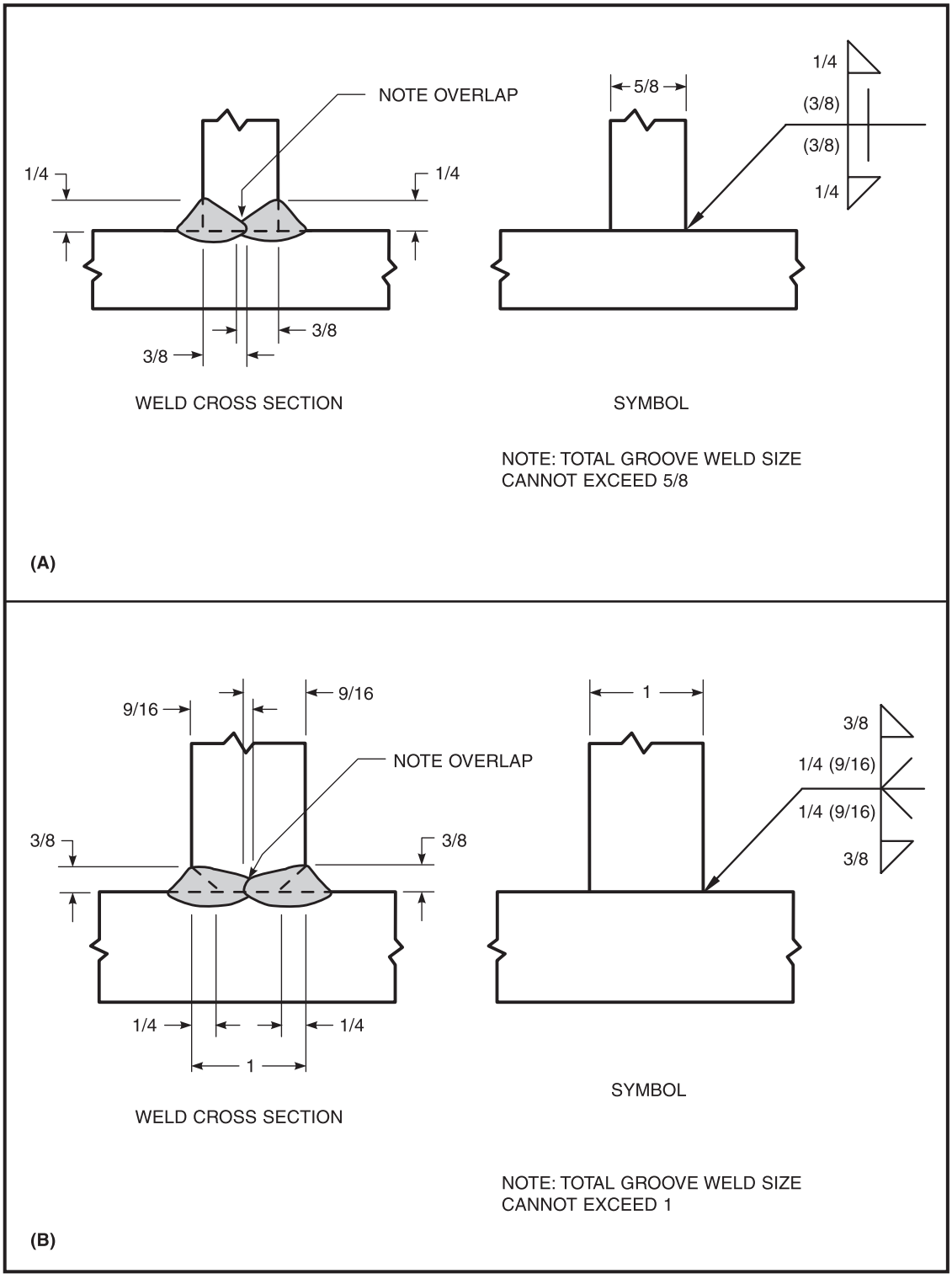
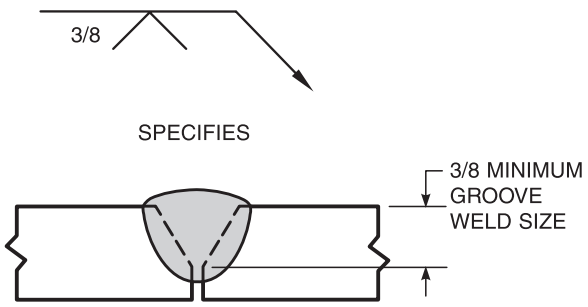


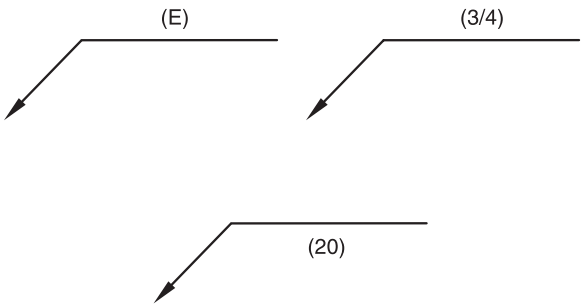
Figure 17—Application of Symbols for Combined Groove and Fillet Welds

6.2.7 Depth of Bevel Specified, Groove Weld Size Not Specified. A welding symbol with a depth of bevel specified, and the groove weld size not included and not specified elsewhere, may be used to specify a groove weld size not less than the depth of bevel.

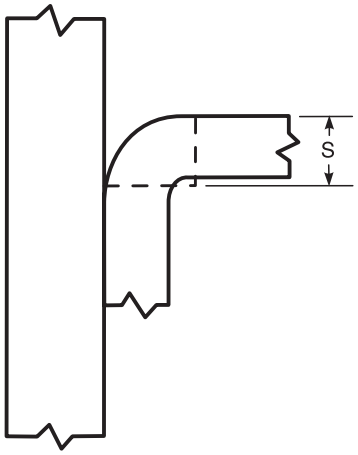


6.2.8 Joint Geometry Not Specified, Complete Joint Penetration Required. Optional joint geometry with complete joint penetration (CJP) required is specified by placing the letters "CJP" in the tail of the welding symbol and omitting the weld symbol (see Figure 20).

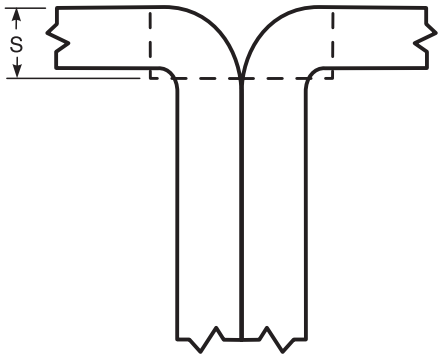
6.2.9 Joint Geometry Not Specified, Groove Weld Size Specified. For optional joint geometry, the groove weld size is specified by placing dimension "(E)" on the arrow side or the other side of the reference line as required, but omitting the weld symbol (see Figure 21).



6.2.10 Flare Groove Welds. Dimension "S" of flare-groove welds is considered as extending only to the tangent point indicated below by dimension lines (see Figure 22(B) and (C) and Annex D6.2.10).



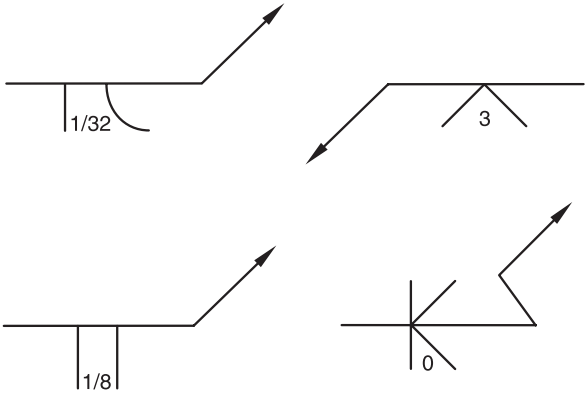
FLARE-BEVEL-GROOVE



FLARE-V-GROOVE

6.3 Groove Dimensions

6.3.1 Root Opening. The root opening of groove welds shall be specified inside the weld symbol and only on one side of the reference line (see Figure 18).



6.3.2 Groove Angle. The groove angle of groove welds shall be specified outside the weld symbol (see Figure 19).

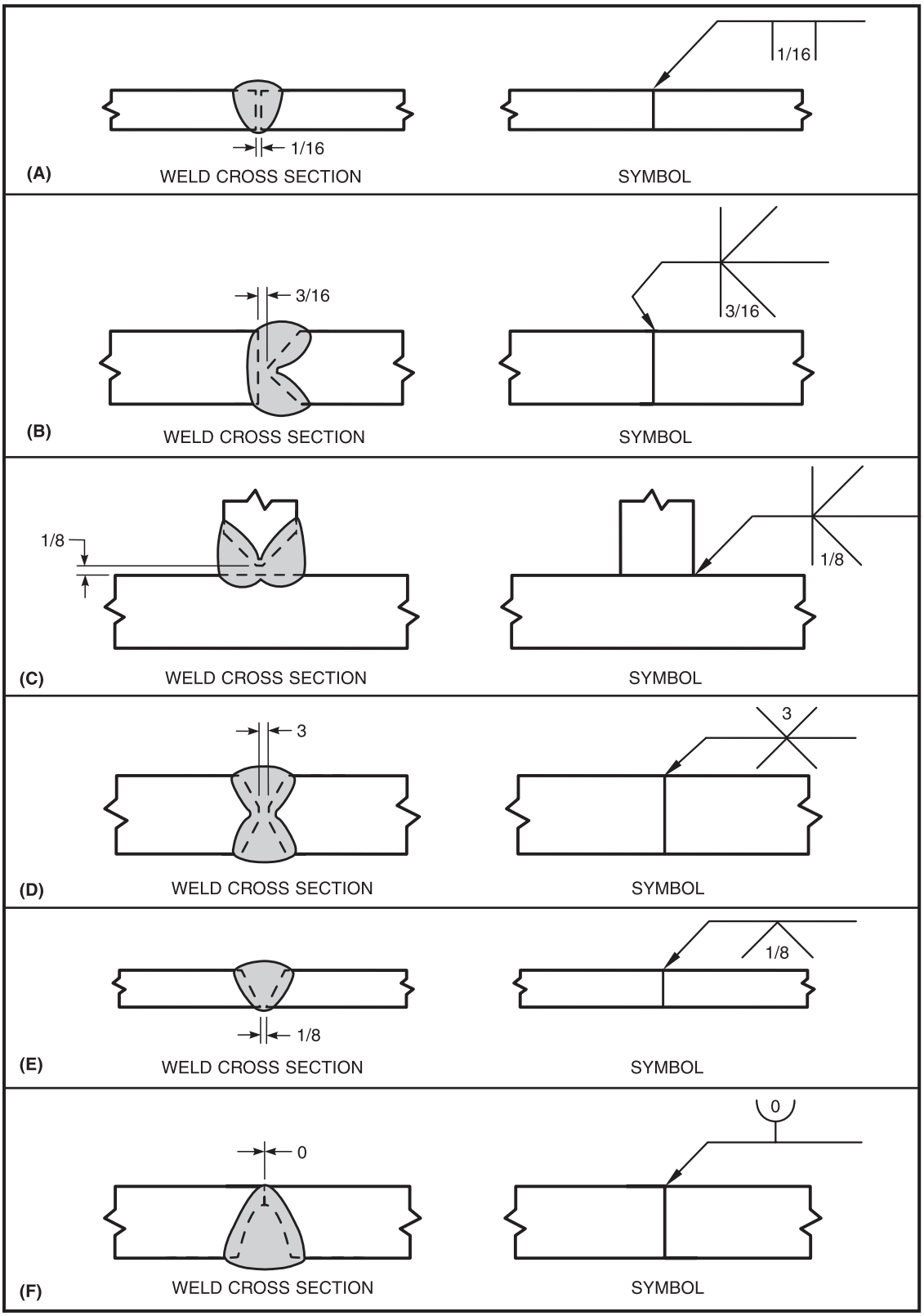


Figure 18—Specification of the Root Opening of Groove Welds

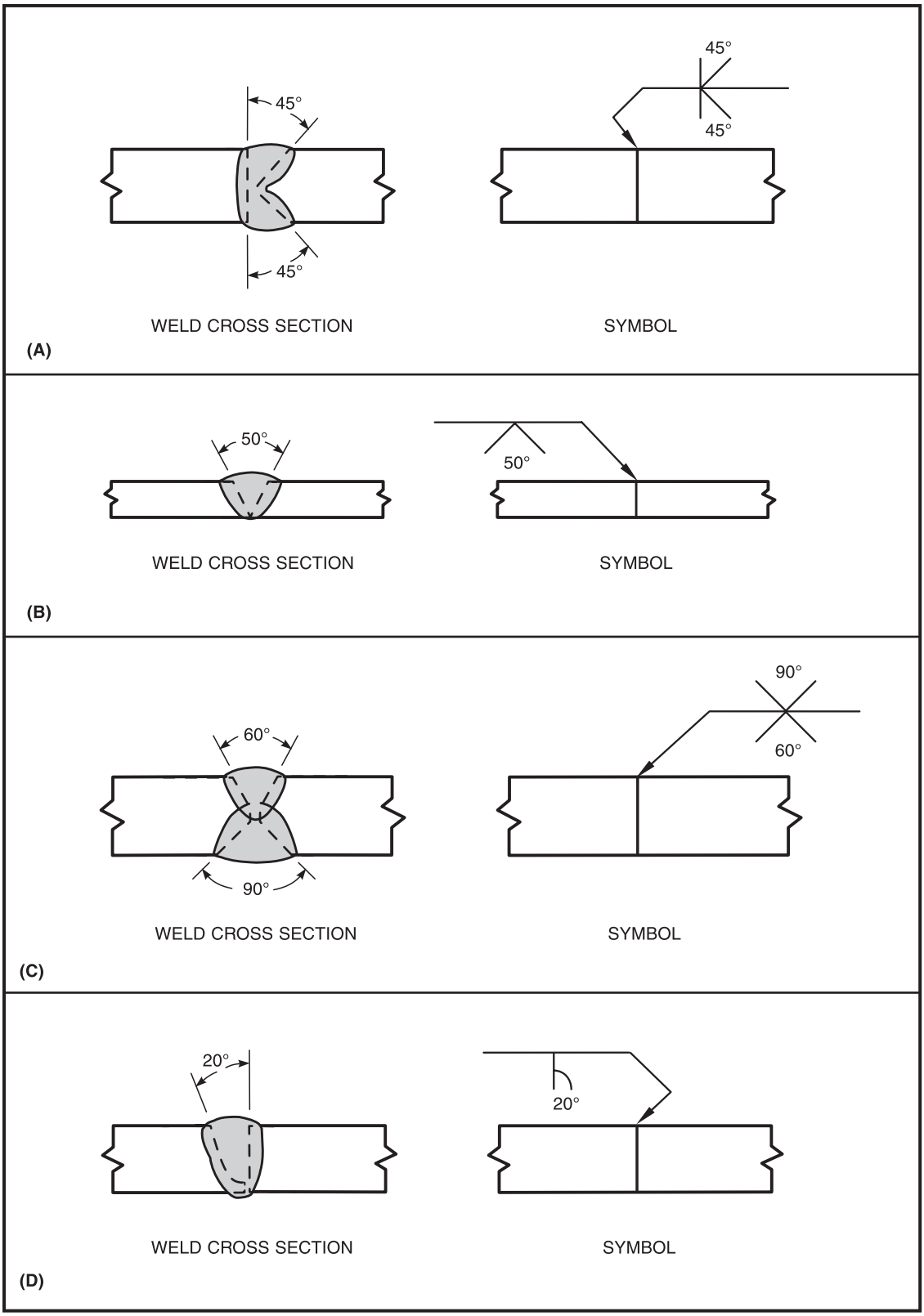


Figure 19—Specification of the Groove Angle of Groove Welds

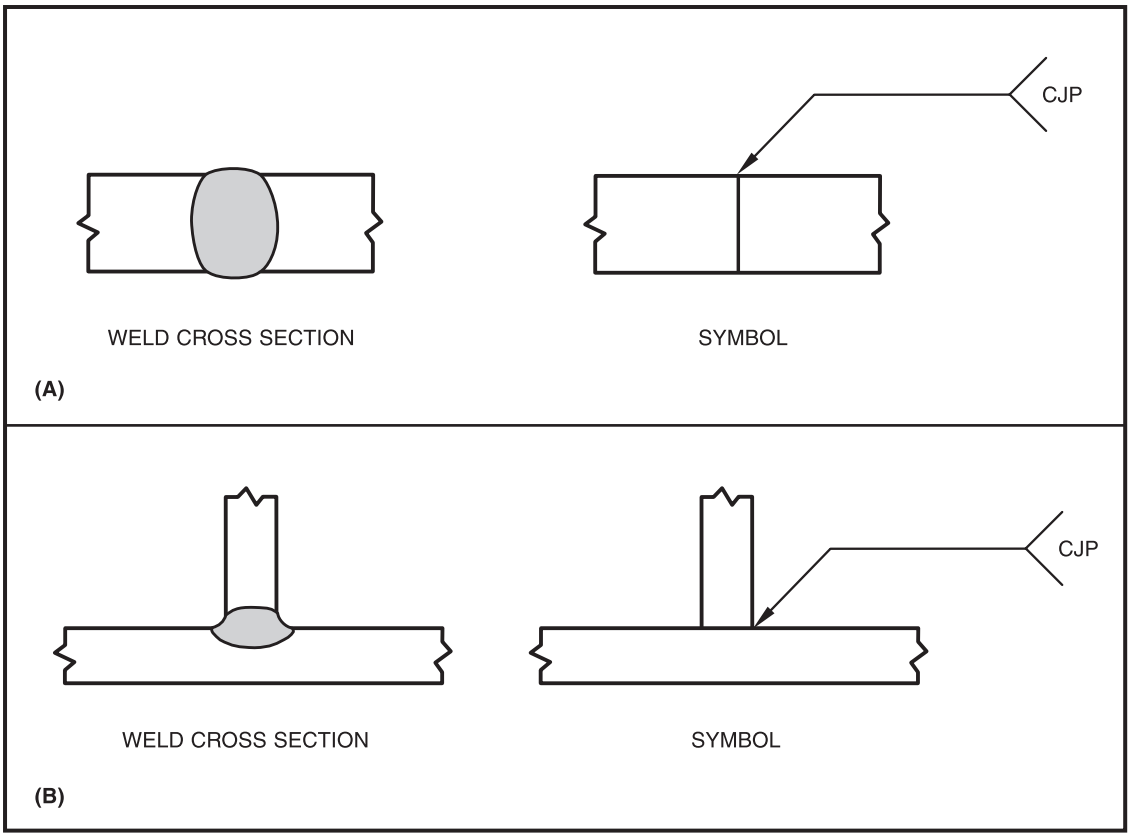


Figure 20—Application of Symbols for Complete Joint Penetration with Joint Geometry Optional

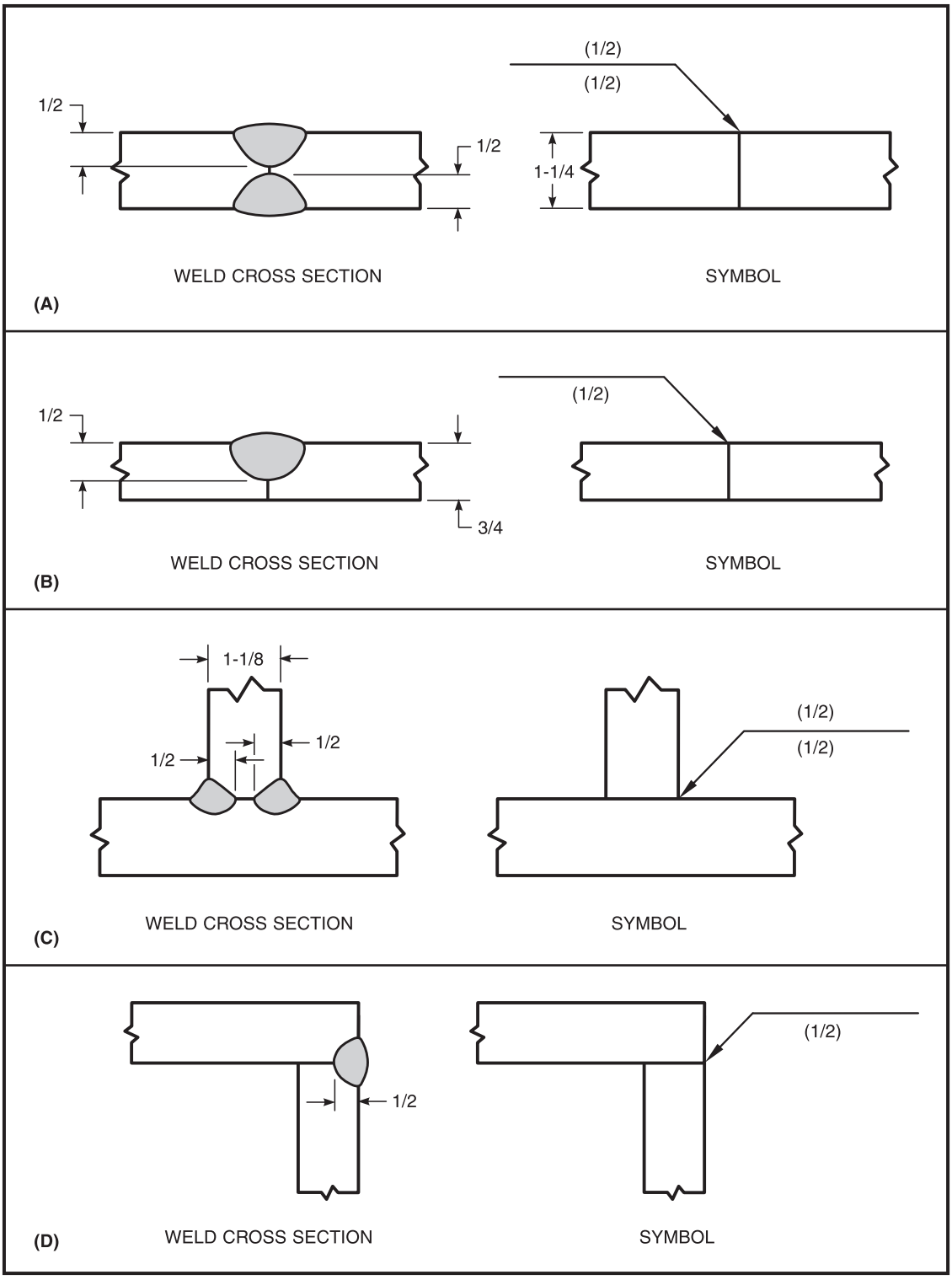


Figure 21—Partial Joint Penetration with the Joint Geometry Optional

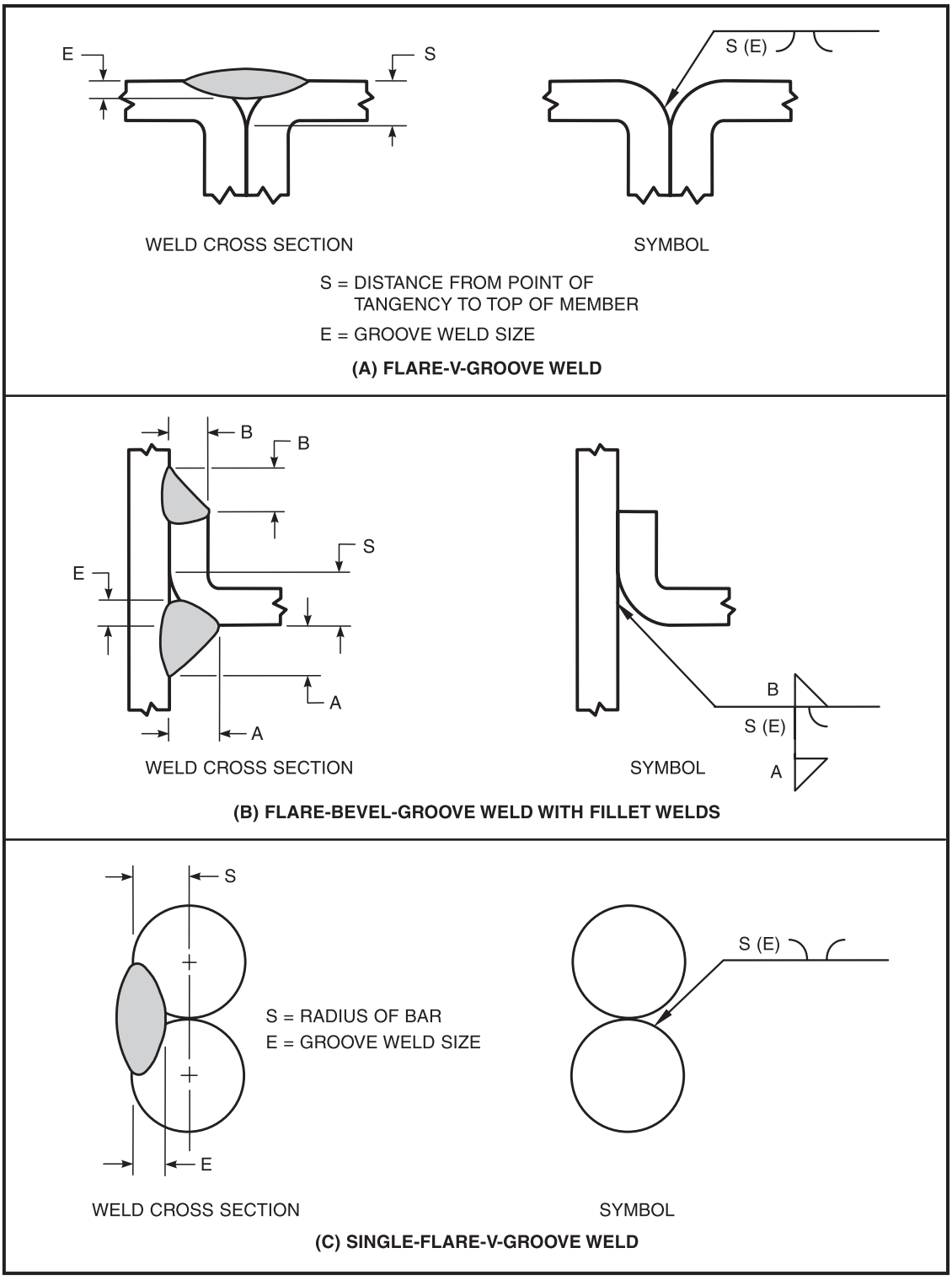


Figure 22—Applications of Flare-Bevel and Flare-V-Groove Weld Symbols

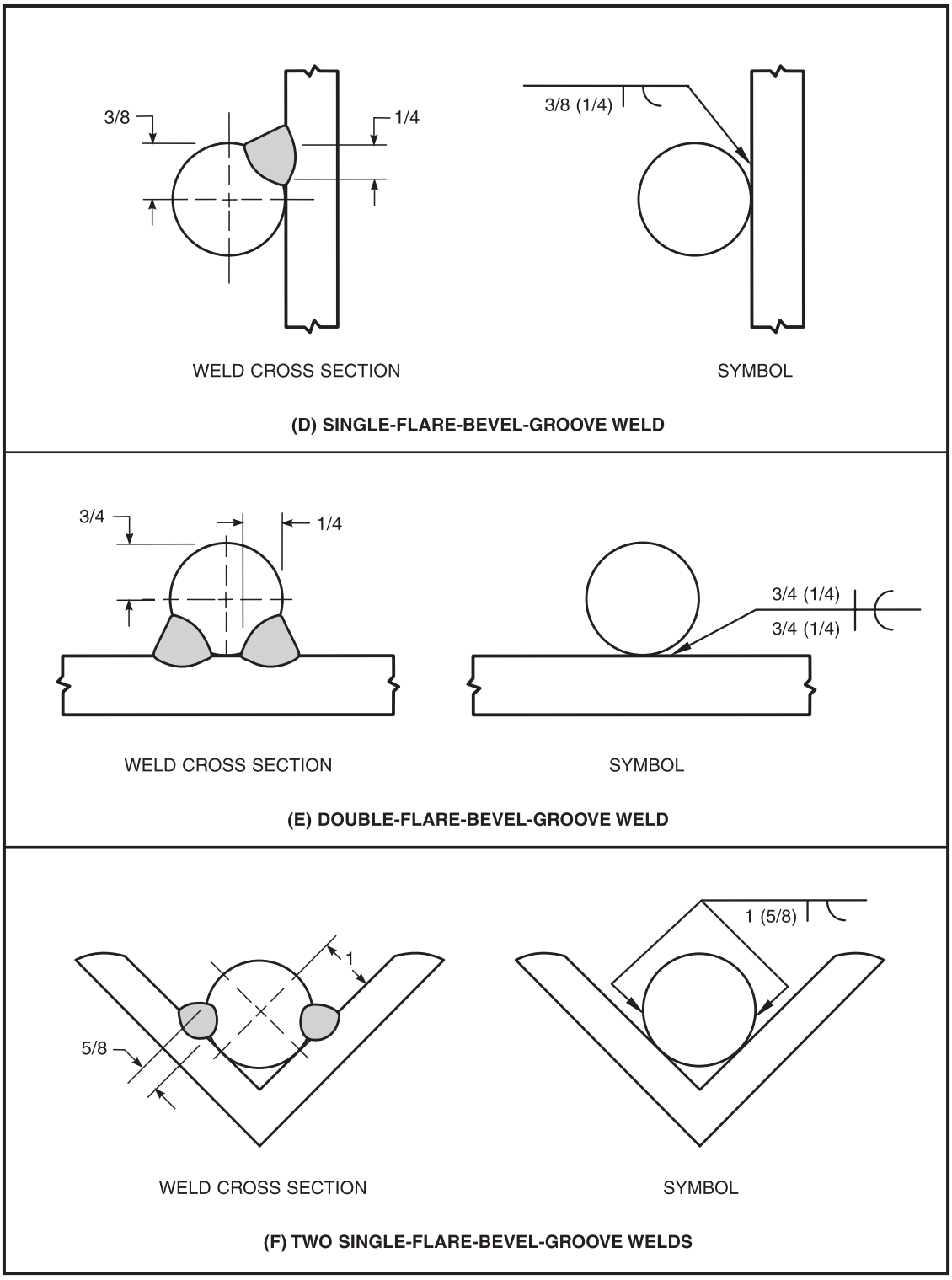
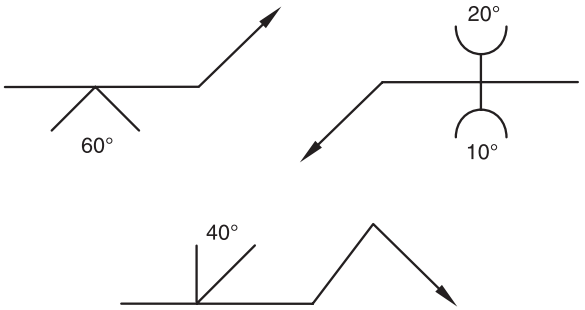
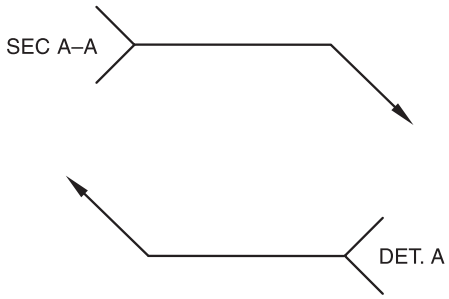


Figure 22 (Continued)—Applications of Flare-Bevel and Flare-V-Groove Weld Symbols

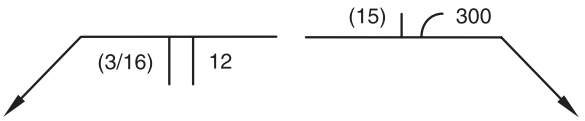


6.3.3 Radii and Root Faces. The groove radii and the root faces of U- and J-groove welds shall be specified by a cross section, detail, or other data with reference thereto in the tail of the welding symbol (see 5.11).



6.4 Length of Groove Welds

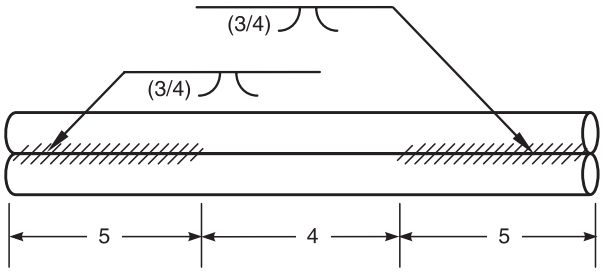
6.4.1 Location. The length of a groove weld, when indicated on the welding symbol, shall be specified to the right of the weld symbol [see Figure 23(A) and (C)].



6.4.1.1 Full Length. When a groove weld is to extend for the full length of the joint, no length dimension need be specified on the welding symbol [see Figure 23(B)].

6.4.1.2 Specific Lengths. Specific lengths of groove welds and their locations may be specified by symbols in conjunction with dimension lines [see Figure 23(C)].

6.4.1.3 Hatching. Hatching may be used to graphically depict groove welds.

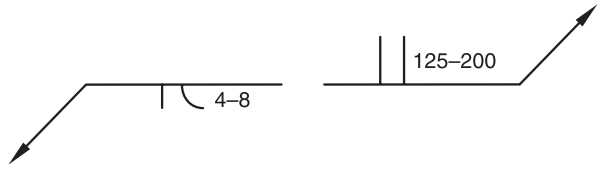


6.4.2 Changes in the Direction of Welding. Symbols for groove welds involving changes in direction of welding shall be in accordance with 5.9.2 (see Figure 24).

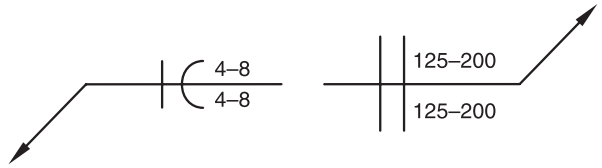
6.5 Intermittent Groove Welds

6.5.1 Pitch. The pitch of intermittent groove welds shall be the distance between the centers of adjacent weld segments on one side of the joint [see Figure 25(A)].

6.5.2 Pitch Dimension Location. The pitch of intermittent groove welds shall be specified to the right of the length dimension following a hyphen [see Figure 25(A)].



6.5.3 Chain Intermittent Groove Welds. Dimensions of chain intermittent groove welds shall be specified on both sides of the reference line. The segments of chain intermittent groove welds are approximately opposite one another across the joint [see Figure 25(B)].



6.5.4 Staggered Intermittent Groove Welds. Dimensions of staggered intermittent groove welds shall be specified on both sides of the reference line, and the groove weld symbols shall be offset on opposite sides of the reference line as shown below. The segments of staggered intermittent groove welds shall be symmetrically spaced on both sides of the joint as shown in Figure 25(C).

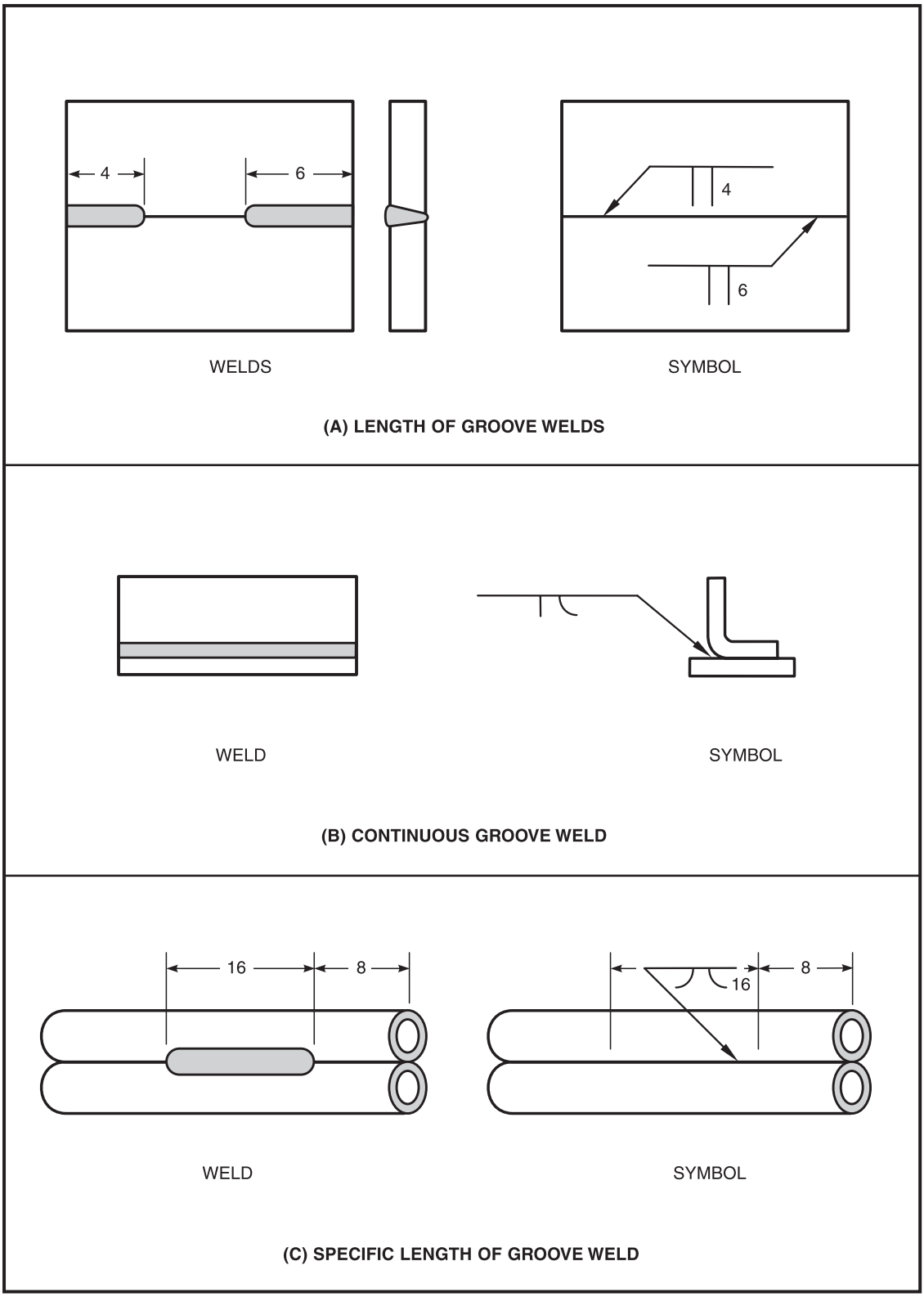


Figure 23—Specification of the Length of Welding of Groove Welds

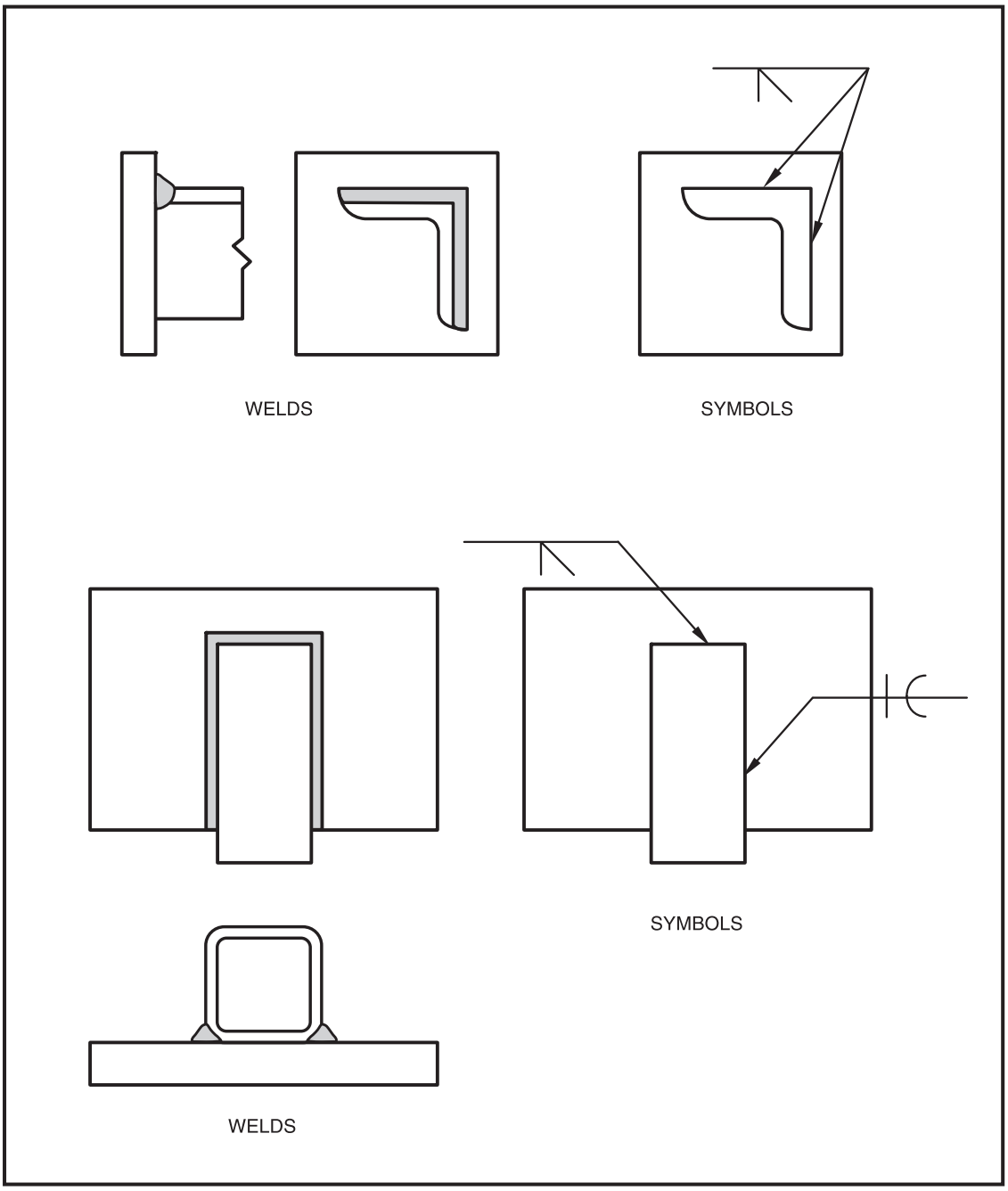


Figure 24—Specification of the Extent of Welding for Groove Welds

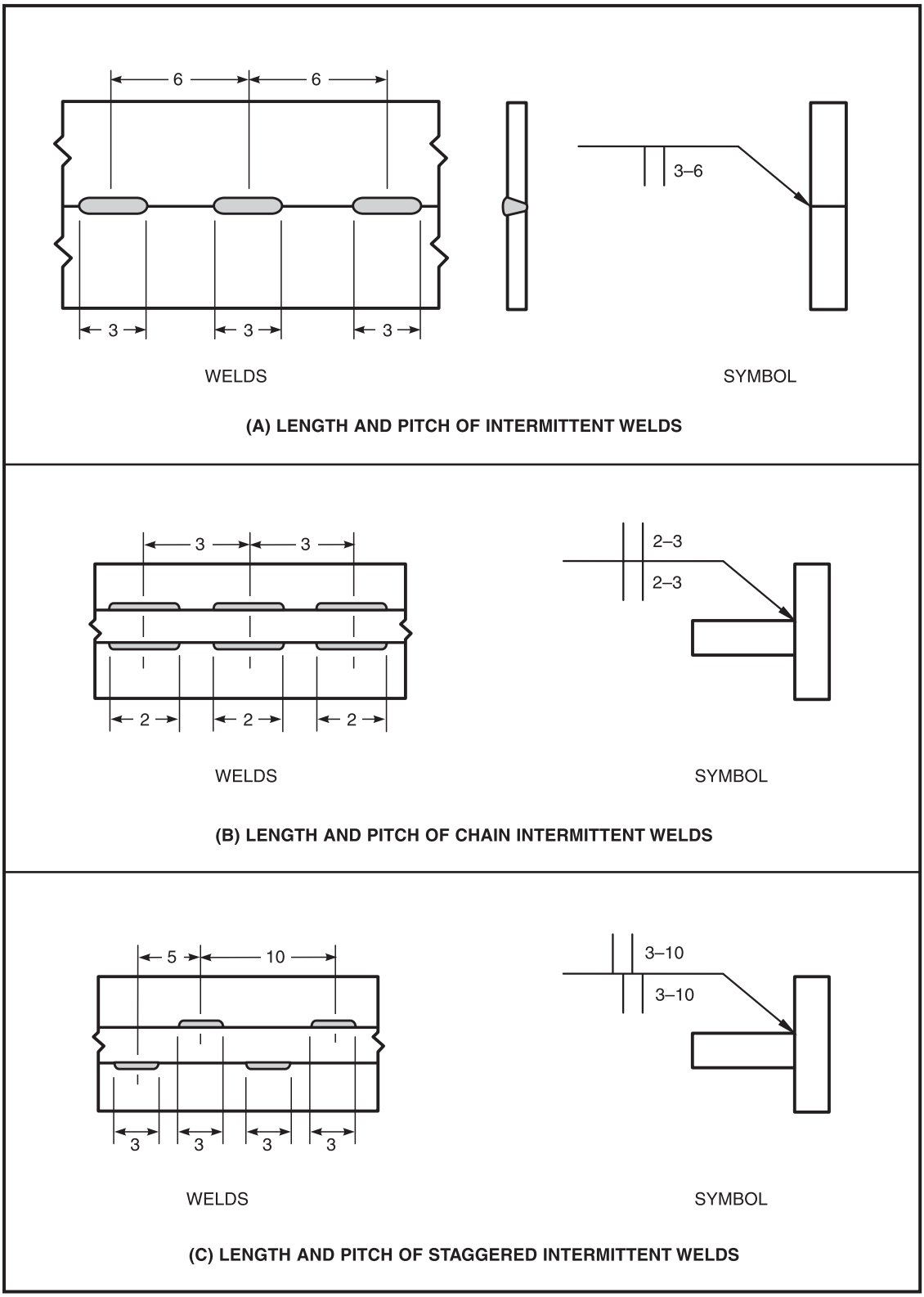


Figure 25—Applications of Intermittent Welds

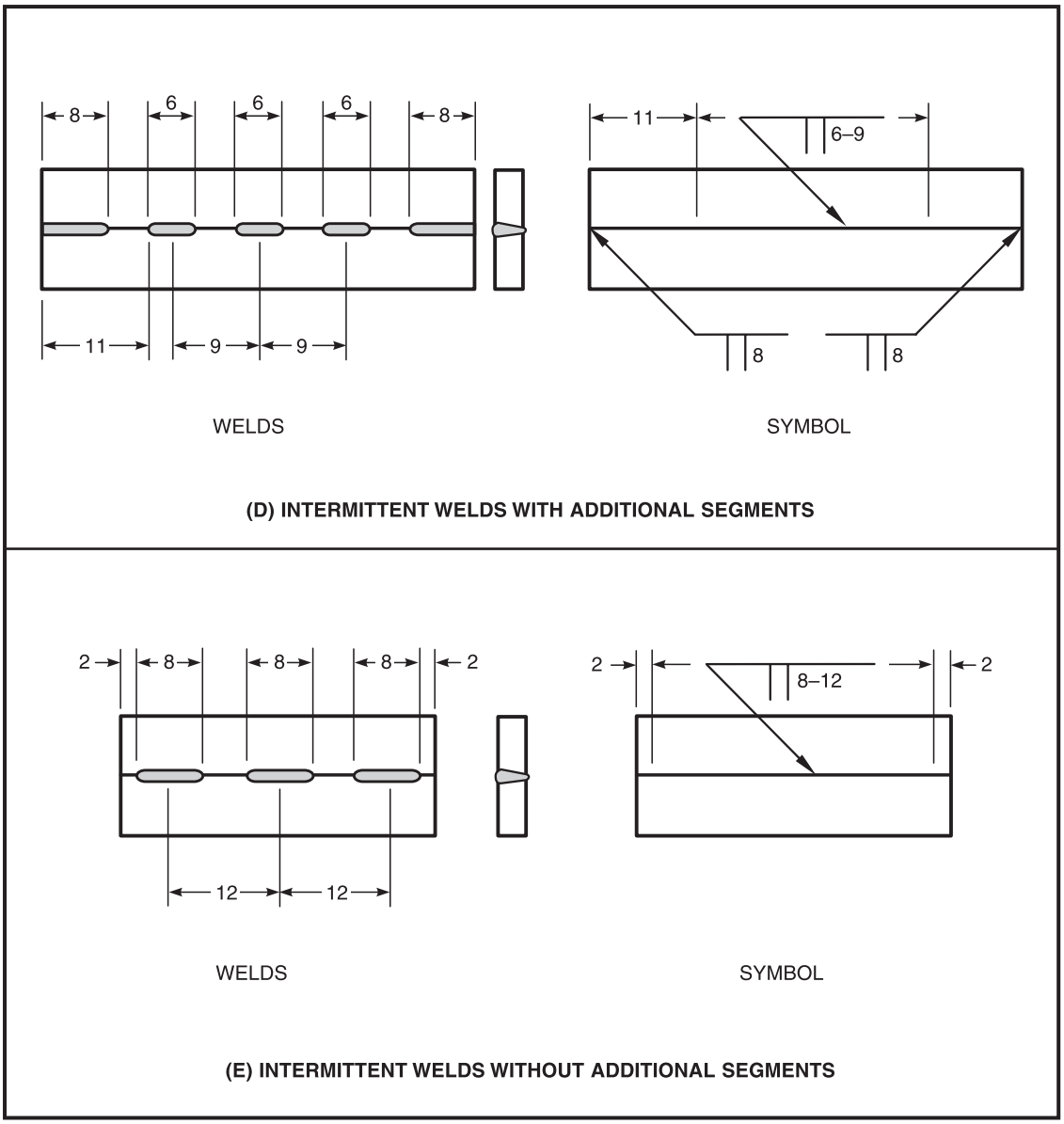
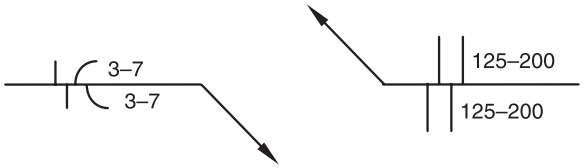


Figure 25 (Continued)—Applications of Intermittent Welds

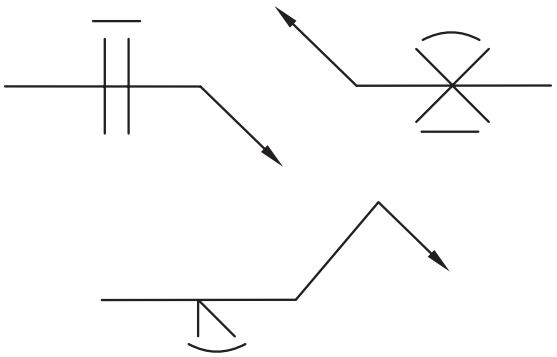


6.5.5 Extent of Welding. In the case of intermittent groove welds, additional weld lengths that are intended at the ends of the joint shall be specified by separate welding symbols and dimensioned on the drawing [see Figure 25(D)]. When no weld lengths are intended at the ends of the joint, the unwelded lengths should not exceed the clear distance between weld segments and should be so dimensioned on the drawing [see Figure 25(E)].

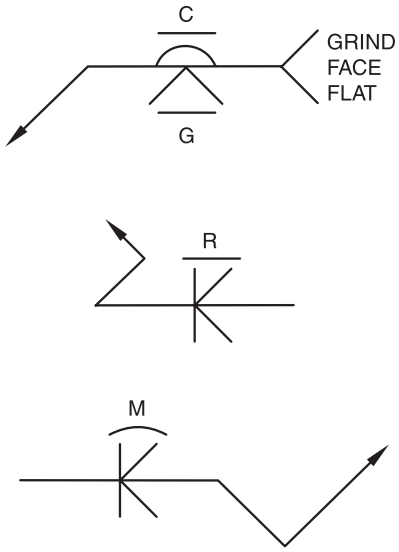
6.5.6 Location of Intermittent Welds. When the location of intermittent welds is not obvious, such as on a circular weld joint, it will be necessary to provide specific segment locations by using dimension lines (see 6.4.1.2 and 7.3.1.2) or hatching (see 6.4.1.3 and 7.3.1.3).

6.6 Contours and Finishing of Groove Welds

6.6.1 Contours Obtained by Welding. Groove welds that are to be welded with approximately flush or convex faces without postweld finishing shall be specified by adding the flush or convex contour symbol to the welding symbol [see 5.12 and Figure 26(A)].



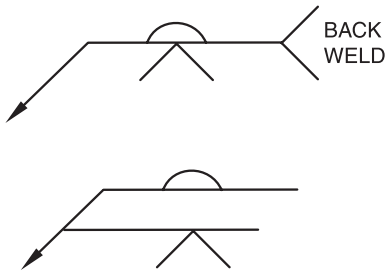
6.6.2 Contours Obtained by Postweld Finishing. Groove welds whose faces are to be finished flush or convex by postweld finishing shall be specified by adding both the appropriate contour symbol and finishing designator to the welding symbol. Welds that require a flat but not flush surface, require an explanatory note in the tail of the welding symbol [see 5.12.2 and Figure 26(B) and (C)].



6.7 Back and Backing Welds

6.7.1 General. The back and backing weld symbols are identical. The sequence of welding determines which designation applies. The back weld is made after the groove weld, and the backing weld is made before the groove weld (see 6.7.2 and 6.7.3).

6.7.2 Back Weld Symbol. The back weld symbol is placed on the side of the reference line opposite a groove weld symbol. When a single reference line is used, "back weld" shall be specified in the tail of the welding symbol. Alternately, if multiple reference lines are used, the back weld symbol shall be placed on a reference line subsequent to the reference line specifying the groove weld [see Figure 27(A)].



6.7.3 Backing Weld Symbol. The backing weld symbol is placed on the side of the reference line opposite a groove weld symbol. When a single reference line is used, "backing weld" shall be specified in the tail of the welding symbol. Alternately, if multiple reference lines are used, the backing weld symbol shall be placed on a reference line prior to the reference line specifying the groove weld [see Figure 27(B) and (C)].

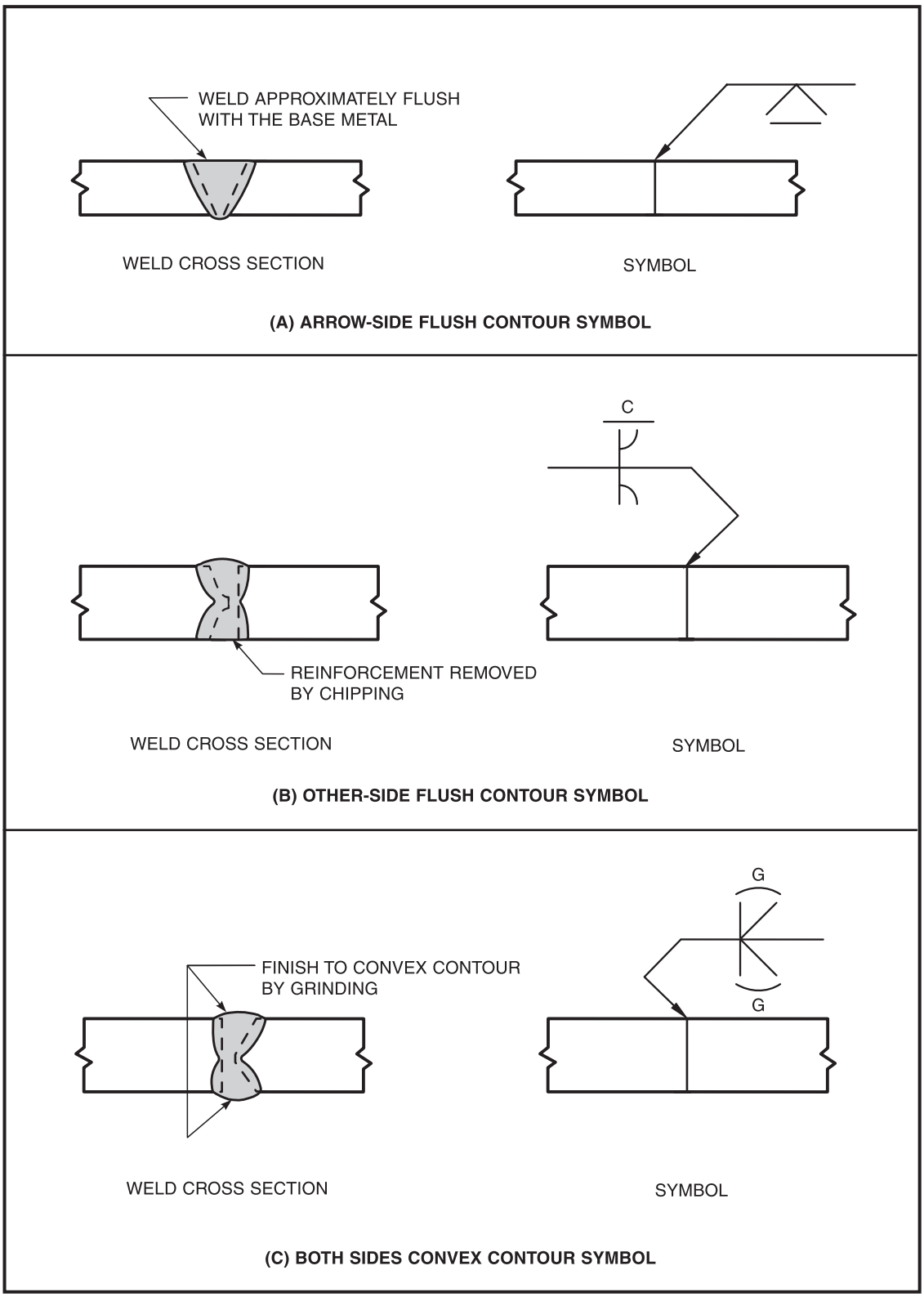


Figure 26—Application of the Flush and Convex Contour Symbols

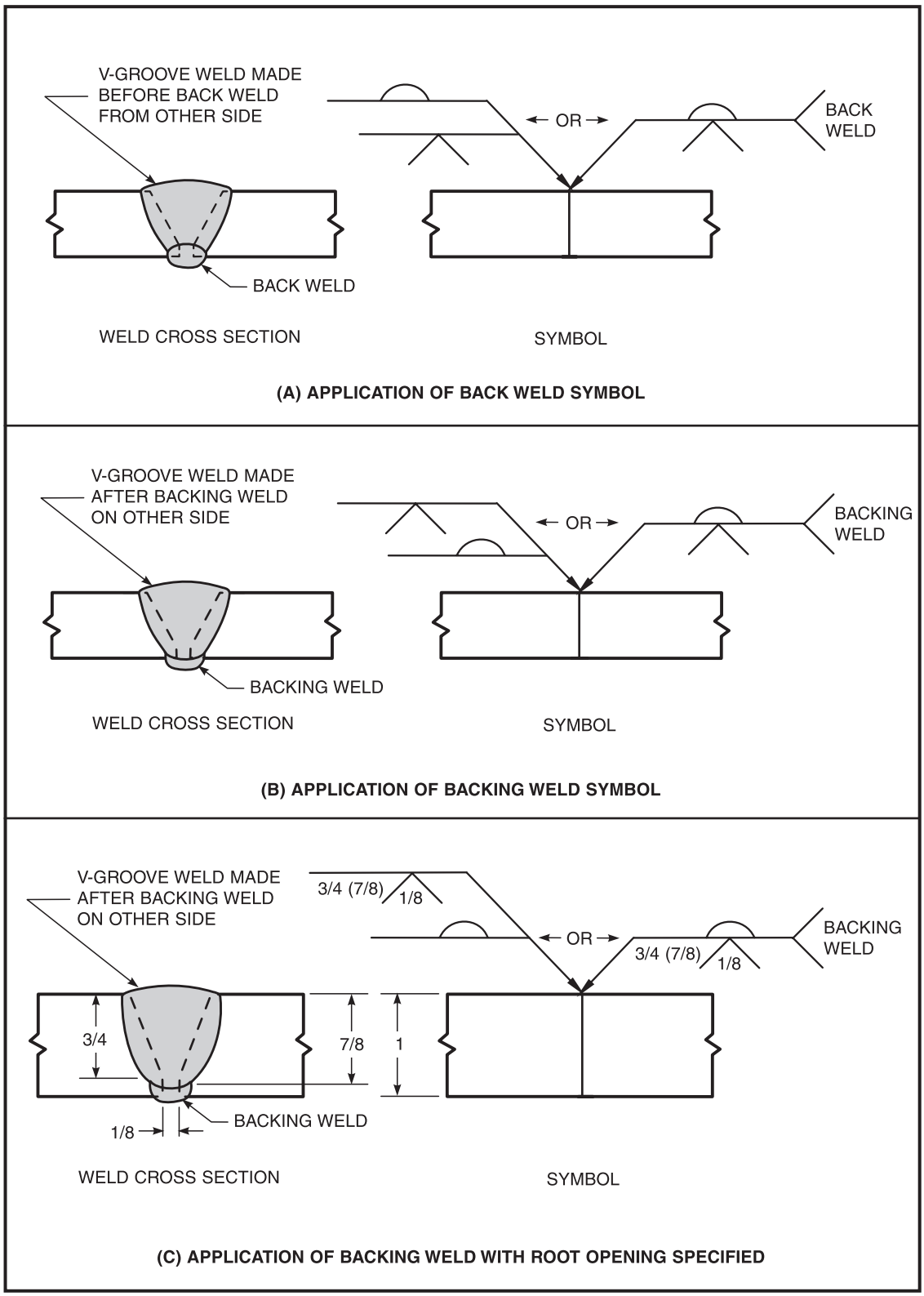
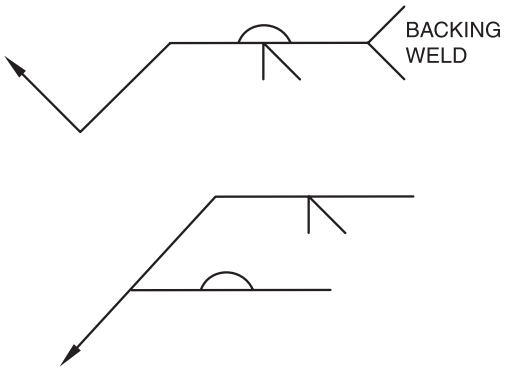
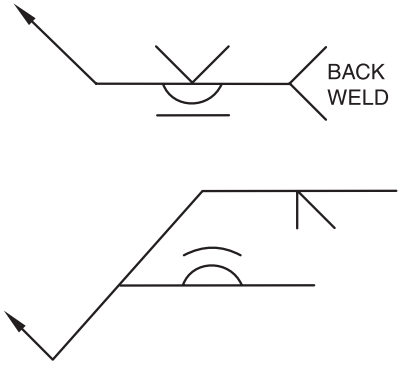


Figure 27—Application of Back or Backing Weld Symbol

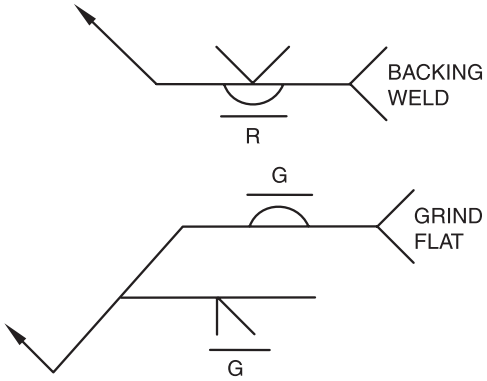


6.7.4 Contour and Finishing of Back or Backing Welds

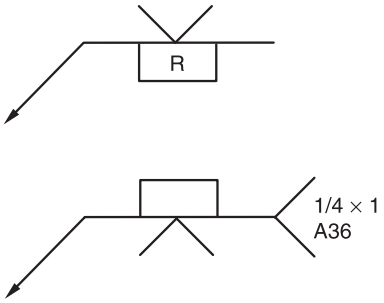
6.7.4.1 Contours Obtained by Welding. Back or backing welds that are to be welded with approximately flush or convex faces without postweld finishing shall be specified by adding the flush or convex contour symbol to the welding symbol (see 5.12).



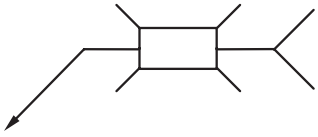
6.7.4.2 Contours Obtained by Postweld Finishing. Back or backing welds that are to be finished approximately flush or convex by postweld finishing shall be specified by adding the appropriate contour symbol and finishing designator to the welding symbol (see 5.12.2 and 5.12.3). Welds that require a flat but not flush surface require an explanatory note in the tail of the welding symbol.



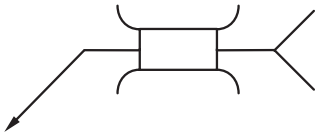
6.8 Joints with Backing. A joint with backing is specified by placing the backing symbol on the side of the reference line opposite the groove weld symbol. If the backing is to be removed after welding, an "R" shall be placed in the backing symbol [see Figure 28(A)]. The material and the dimensions of the backing shall be specified in the tail of the welding symbol or on the drawing.



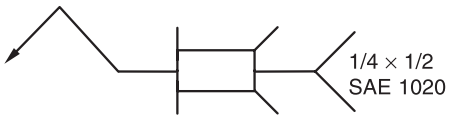
6.9 Joints with Spacers. A joint with a required spacer is specified with the groove weld symbol modified to show a rectangle within it [see Figure 28(B)]. In case of multiple reference lines, the rectangle shall appear on the reference line nearest to the arrow [see Figure 28(C)]. The material and the dimensions of the spacer shall be specified in the tail of the welding symbol or on the drawing.



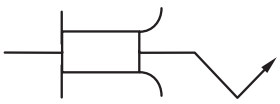
DOUBLE-V-GROOVE



DOUBLE-U-GROOVE

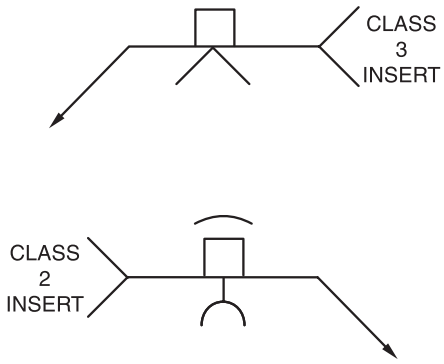


DOUBLE-BEVEL-GROOVE



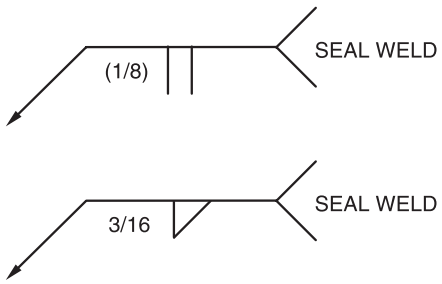
DOUBLE-J-GROOVE

6.10 Consumable Inserts. Consumable inserts shall be specified by placing the consumable insert symbol on the side of the reference line opposite the groove weld symbol (see Figure 29). The AWS consumable insert class shall be placed in the tail of the welding symbol (for the AWS insert classes, see AWS A5.30/A5.30M, *Specification for Consumable Inserts*).



6.11 Groove Welds with Backgouging. Along with other joint details, the welding symbol shall include a reference to backgouging in the tail. In the case of nonsymmetrical double-groove welds, the symbol shall show the required depth of groove for each side of the joint [see Figure 30(A)], together with the required groove angles. In the case of single-groove welds without a root face or symmetrical double-groove welds without a root face, the welding symbol need not include the depth of groove dimension [see 6.2.2 and Figure 30(B) and (C)].

6.12 Seal Welds. When the intent of the weld is to fulfil a sealing function only, the weld shall be specified in the tail of the welding symbol as a seal weld (see Annex D6.12).



6.13 Skewed Joints. When the angle between the fusion faces is such that the identification of the weld type and, hence, proper weld symbol is in question, the detail of the desired joint and weld configuration shall be shown on the drawing with all necessary dimensions (see Figure 31).

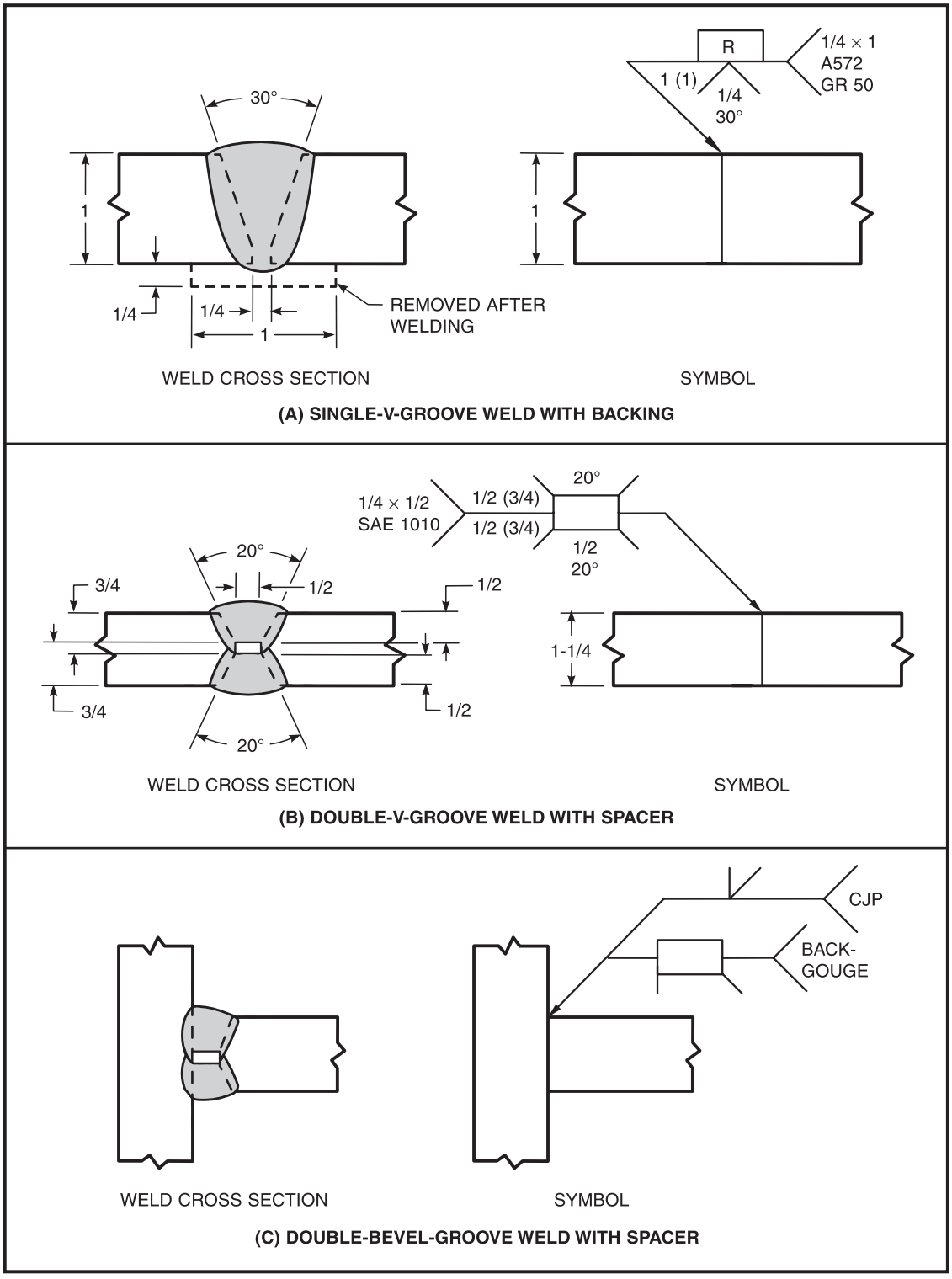


Figure 28—Joints with Backing or Spacers

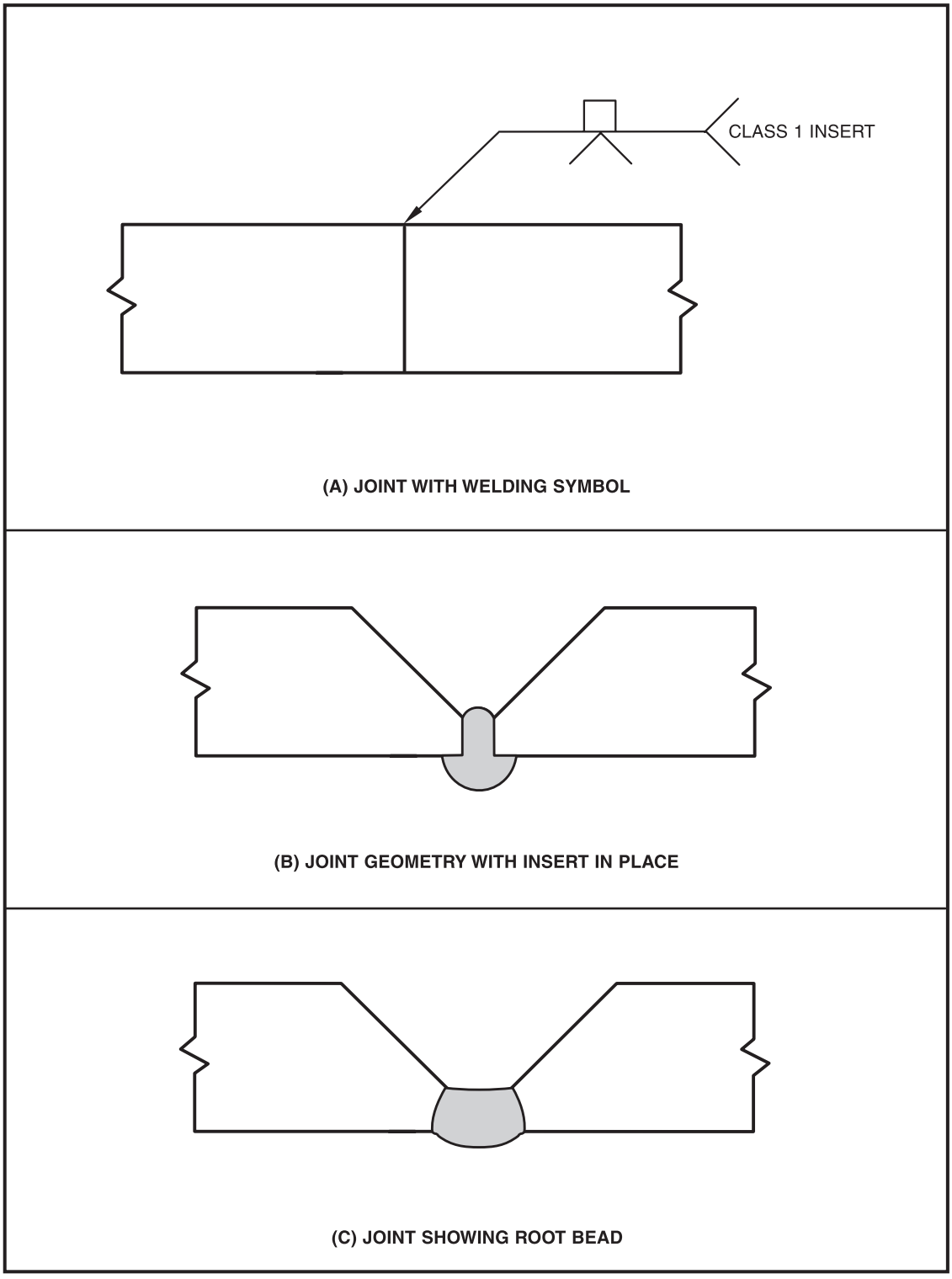


Figure 29—Application of Consumable Insert Symbol

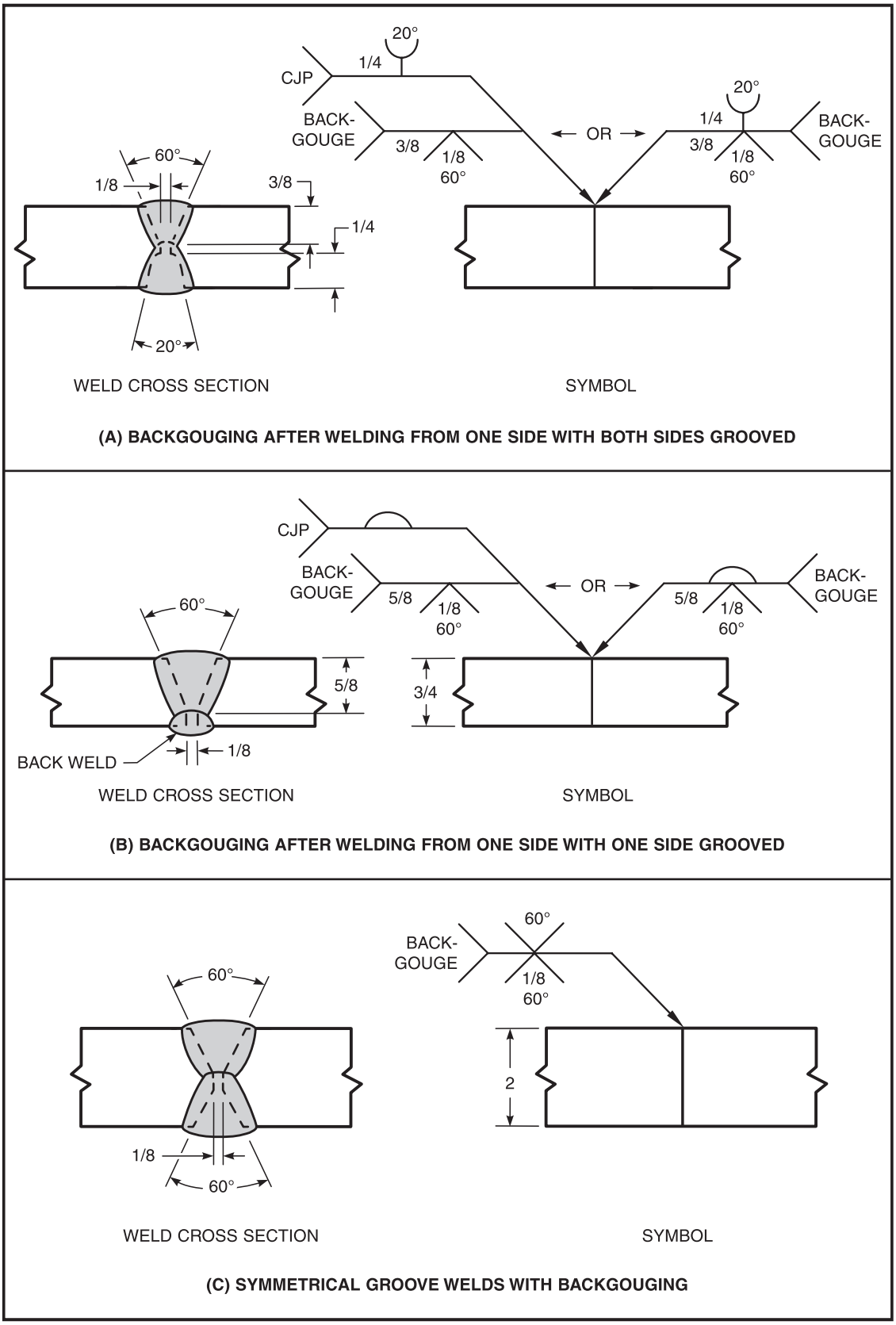


Figure 30—Application of the Symbol for Groove Welds with Backgouging

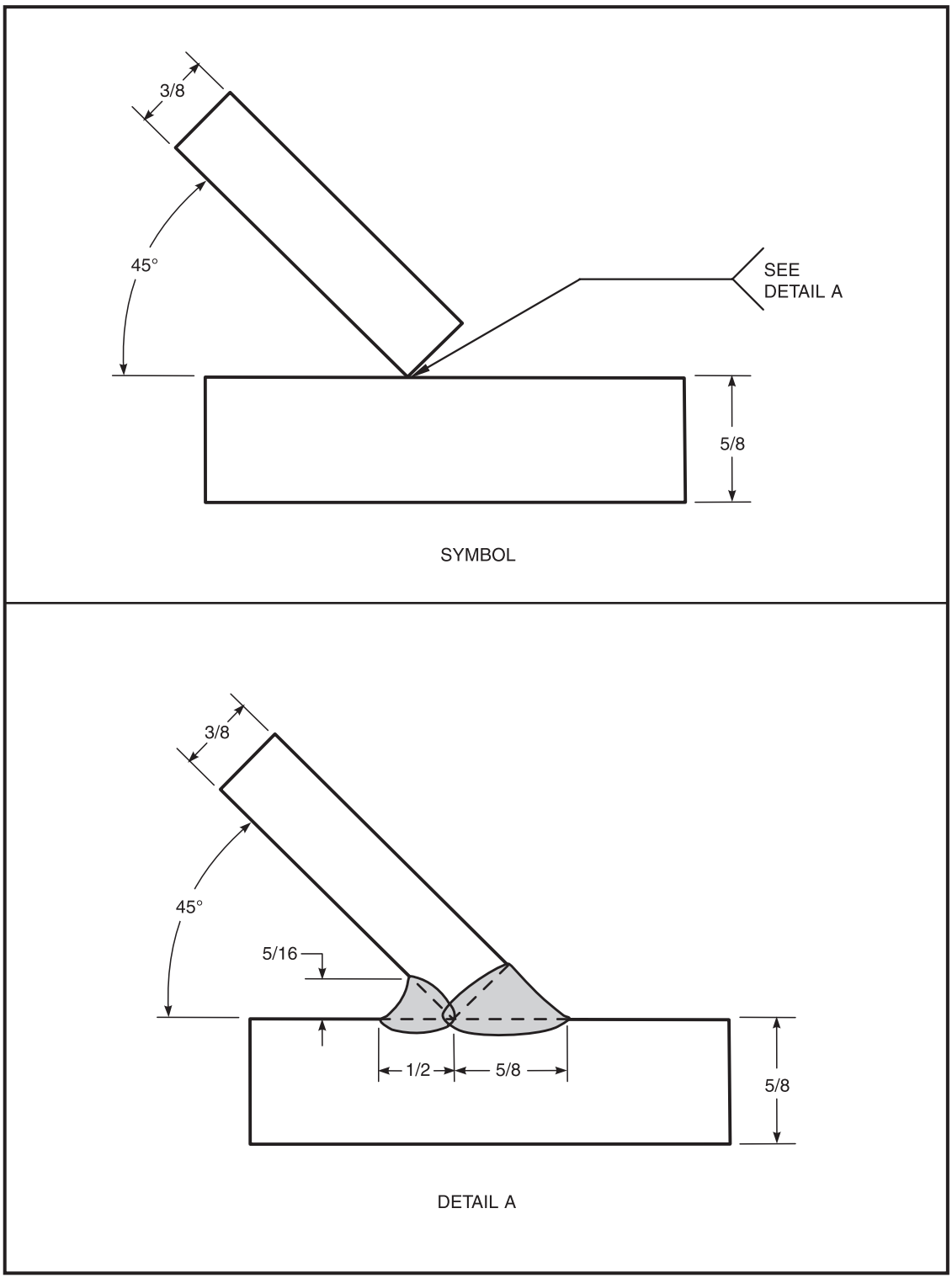
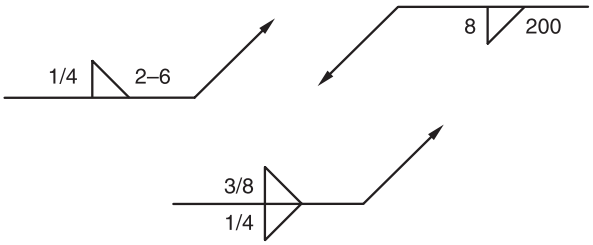


Figure 31—Skewed Joint

7. Fillet Welds

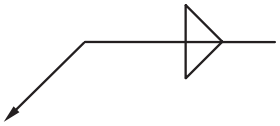
7.1 General

7.1.1 Dimension Location. The dimensions of fillet welds shall be shown on the same side of the reference line as the weld symbol (see Figures 32 through 34).



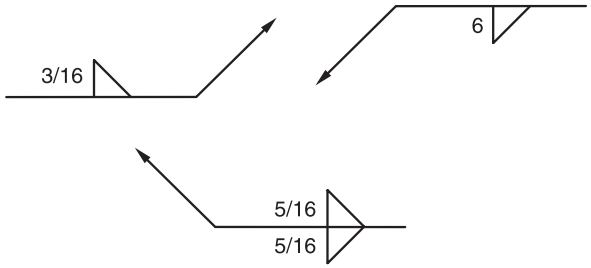
7.1.2 Double Fillet Welds. The dimensions of fillet welds on both sides of a joint shall be specified whether the dimensions are identical or different [see Figure 32(B) and (C) and Figure 34(B) and (C)].

7.1.3 Drawing Notes. Dimensions of fillet welds covered by drawing notes need not be repeated on the welding symbols in accordance with 5.11.6.

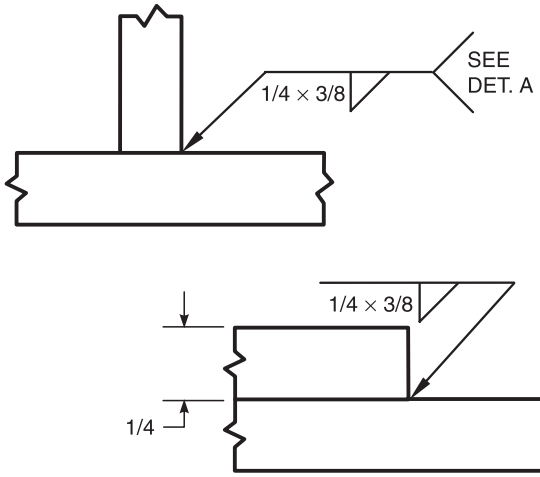


7.2 Size of Fillet Welds

7.2.1 Location. The fillet weld size, "S," shall be specified to the left of the weld symbol [see Figure 32(A), (B), (C), and (D)].

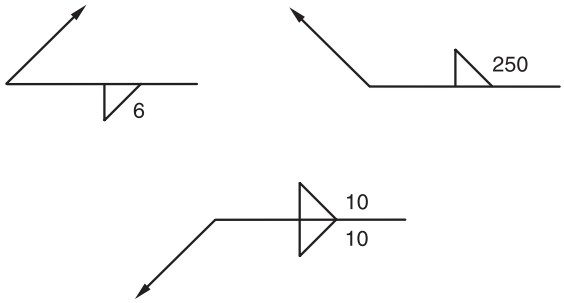


7.2.2 Unequal Legs. The size of a fillet weld, "S," with unequal legs shall be specified to the left of the weld symbol as shown below. Weld orientation is not specified by the symbol and shall be shown on the drawing to ensure clarity [see Figure 32(D)].



7.3 Length of Fillet Welds

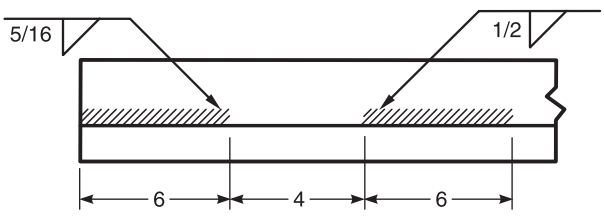
7.3.1 Location. The length of a fillet weld, when indicated on the welding symbol, shall be specified to the right of the weld symbol [see Figure 32(F)].



7.3.1.1 Full Length. When a fillet weld extends for the full length of the joint, no length dimension need be specified on the welding symbol [see Figure 32(A), (B), (C), (D), and (E)].

7.3.1.2 Specific Lengths. Specific lengths of fillet welds, and their location, may be specified by symbols in conjunction with dimension lines [see Figures 8(C) and 32(F)].

7.3.1.3 Hatching. Hatching may be used to graphically depict fillet welds (see 6.4.1.3).

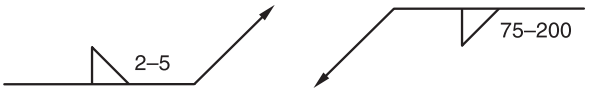


7.3.2 Changes in Direction of Welding. Symbols for fillet welds involving changes in the direction of welding shall be in accordance with 5.9.2 [see Figure 9(A)].

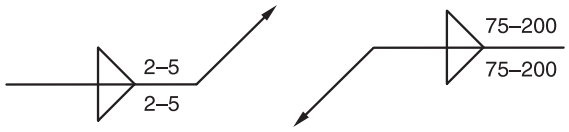
7.4 Intermittent Fillet Welds

7.4.1 Pitch. The pitch of intermittent fillet welds shall be the distance between the centers of adjacent weld segments on one side of the joint [see Figure 33(A)].

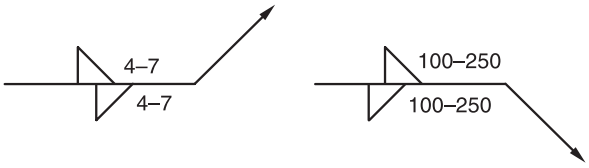
7.4.2 Pitch Dimension Location. The pitch of intermittent fillet welds shall be specified to the right of the length dimension following a hyphen (see Figure 33).



7.4.3 Chain Intermittent Fillet Welds. Dimensions of chain intermittent fillet welds shall be specified on both sides of the reference line. The segments of chain intermittent fillet welds shall be opposite one another across the joint [see Figure 33(B)].



7.4.4 Staggered Intermittent Fillet Welds. The dimensions of staggered intermittent fillet welds shall be specified on both sides of the reference line, and the fillet weld symbols shall be offset on opposite sides of the reference line as shown below. The segments of staggered intermittent fillet welds shall be symmetrically spaced on both sides of the joint as shown in Figure 33(C).



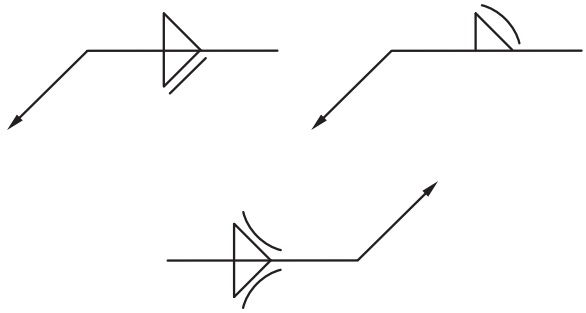
7.4.5 Extent of Welding. In the case of intermittent fillet welds, additional weld lengths that are intended at the ends of the joint shall be specified by separate welding symbols and dimensioned on the drawing [see Figure 33(D)]. When no weld lengths are intended at the ends of the joint, the unwelded lengths should not exceed the clear distance between weld segments and be so dimensioned on the drawing [see Figure 33(E)].

7.4.6 Location of Intermittent Welds. When the location of intermittent welds is not obvious, such as on a circular weld joint, it will be necessary to provide specific segment locations by dimension lines (see 6.4.1.2 and 7.3.1.2) or by hatching (see 6.4.1.3 and 7.3.1.3).

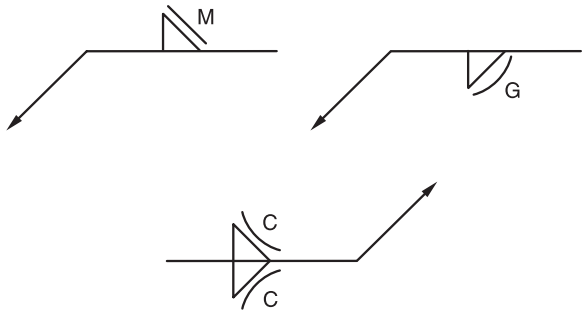
7.5 Fillet Welds in Holes and Slots. Fillet welds in holes and slots shall be specified by the use of fillet weld symbols [see Figure 34(A)].

7.6 Contours and Finishing of Fillet Welds

7.6.1 Contours Obtained by Welding. Fillet welds that are to be welded with approximately flat, convex, or concave faces without postweld finishing shall be specified by adding the flat, convex, or concave contour symbol to the welding symbol (see 5.12.1).



7.6.2 Contours Obtained by Postweld Finishing. Fillet welds that are to be finished approximately flat, convex, or concave by postweld finishing shall be specified by adding both the appropriate contour symbol and finishing designator to the welding symbol (see 5.12.2).



7.7 Skewed Joints. When the angle between the fusion faces is such that the identification of the weld type and thus the proper weld symbol may be in question, the detail of the desired joint and weld configuration shall be shown on the drawing (see 6.13 and Figure 31).

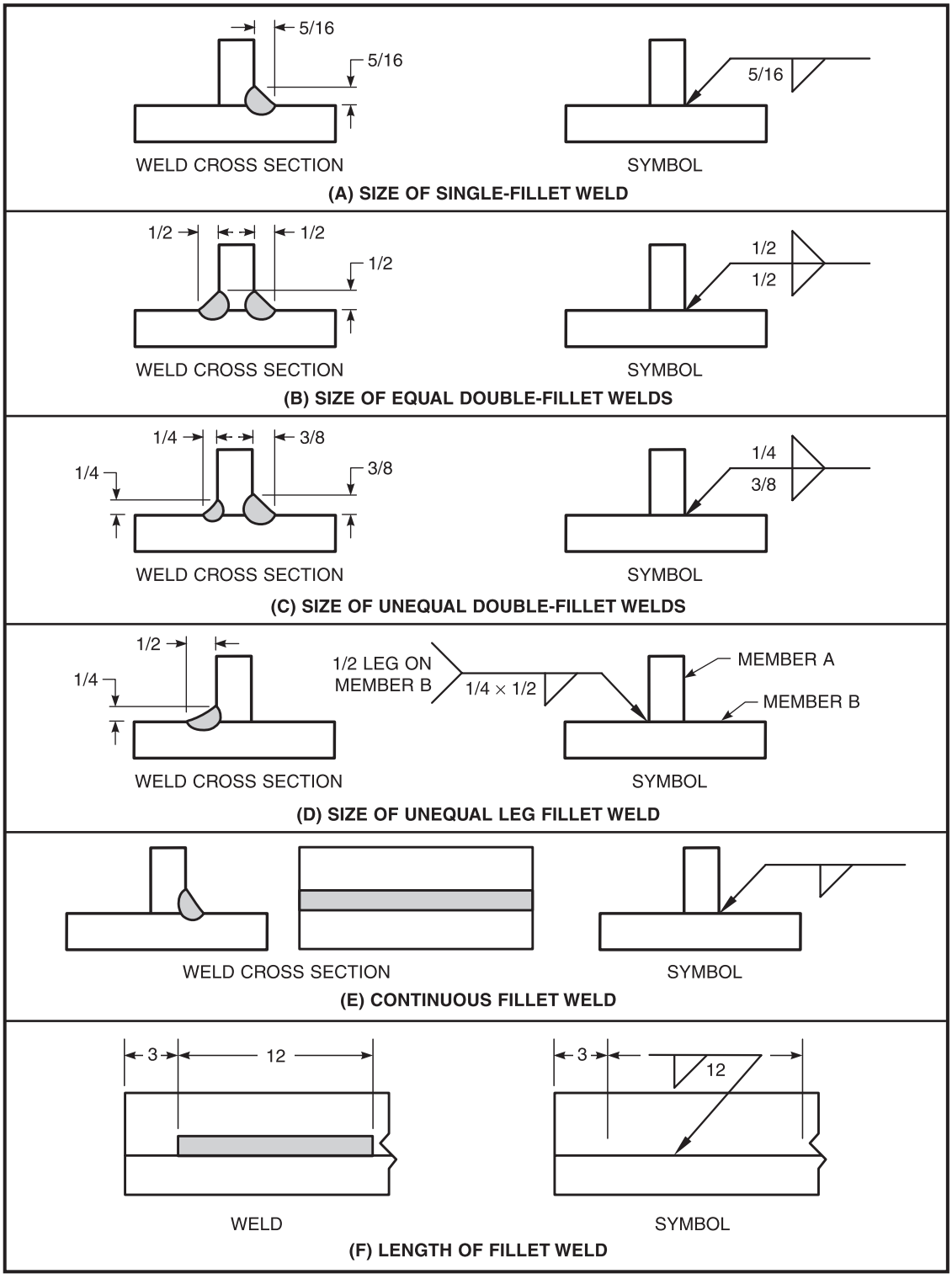


Figure 32—Application of the Symbols for the Size and Length of Fillet Welds

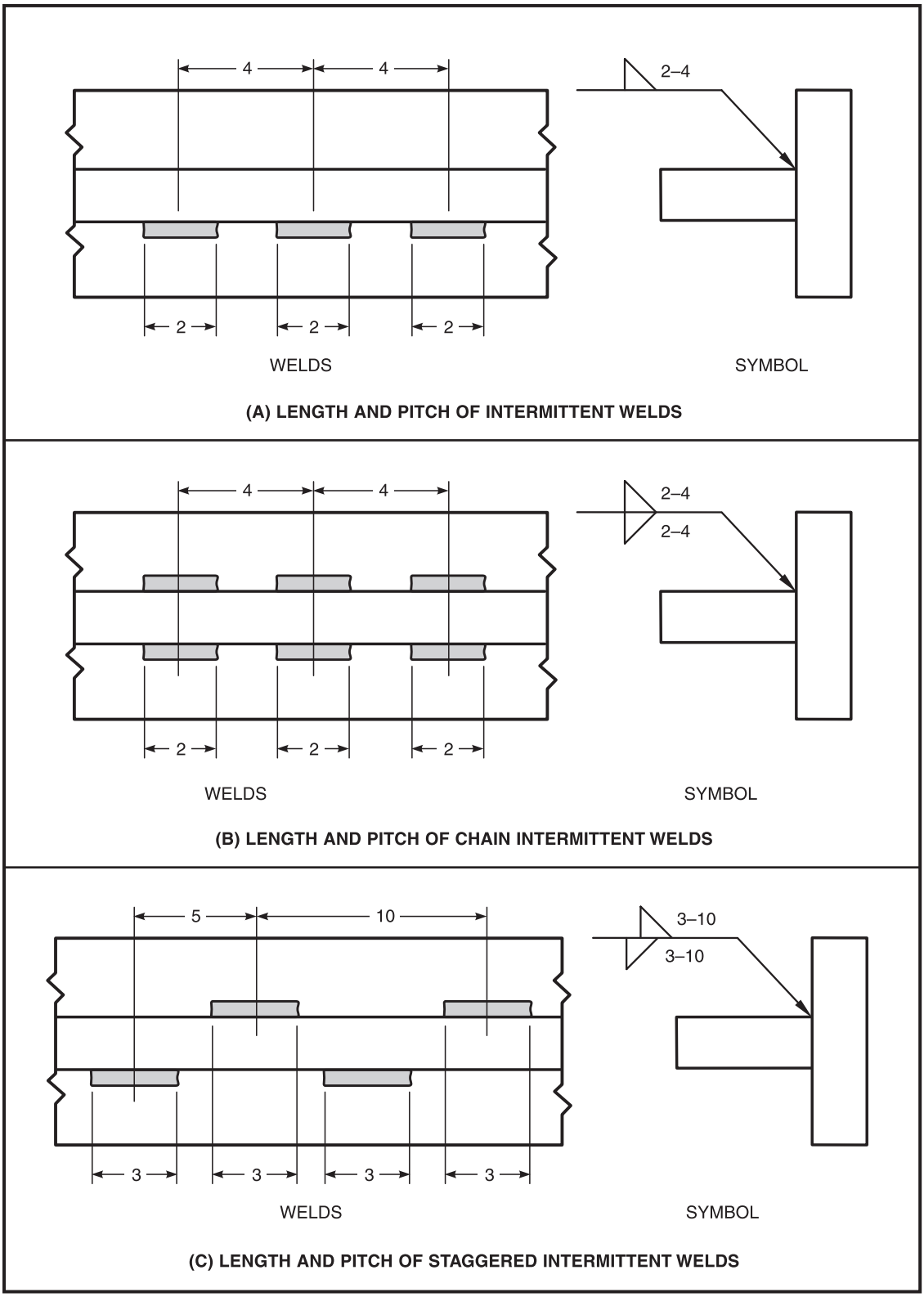


Figure 33—Application of the Intermittent Fillet Weld Symbol

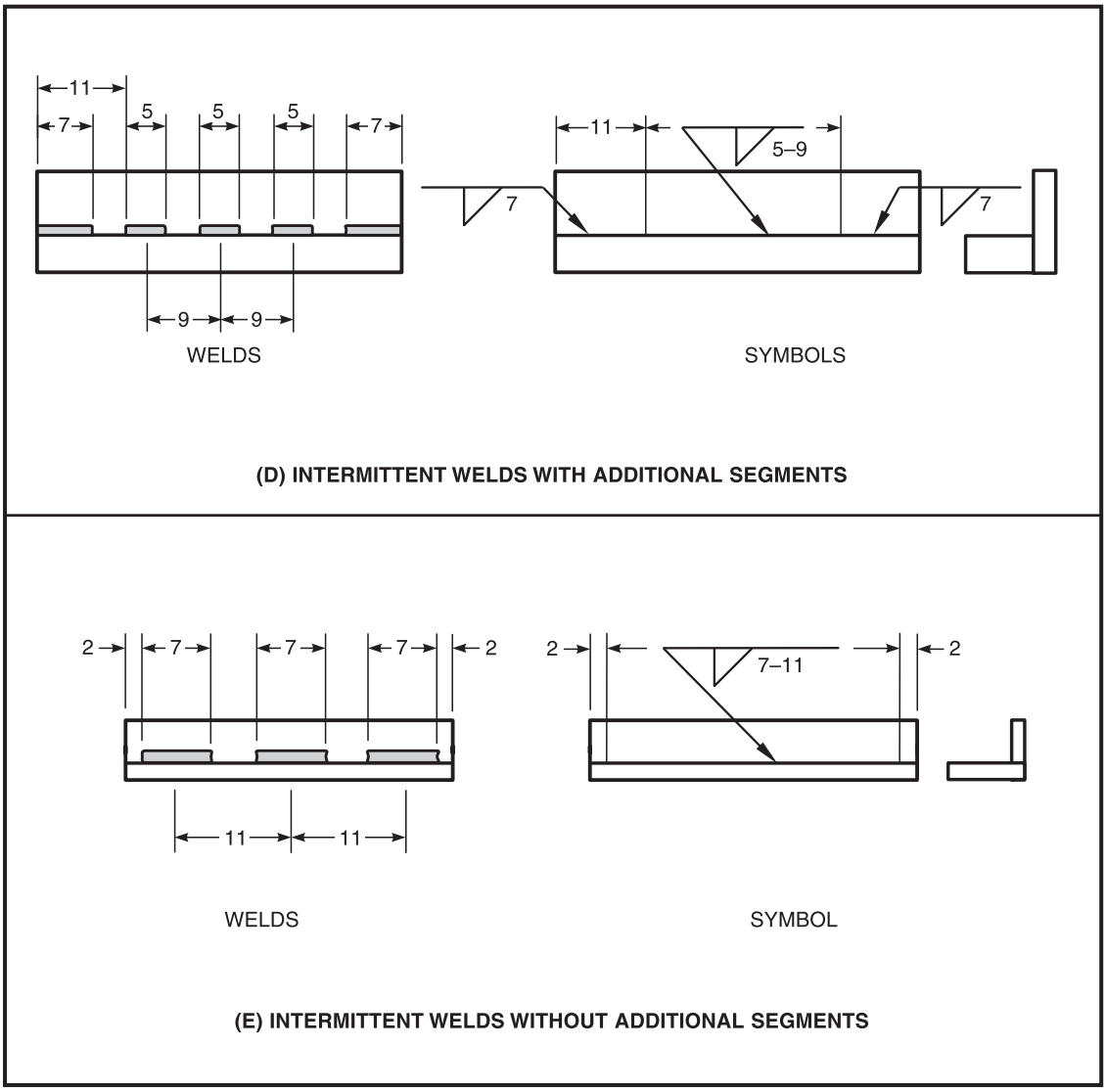


Figure 33 (Continued)—Application of the Intermittent Fillet Weld Symbol

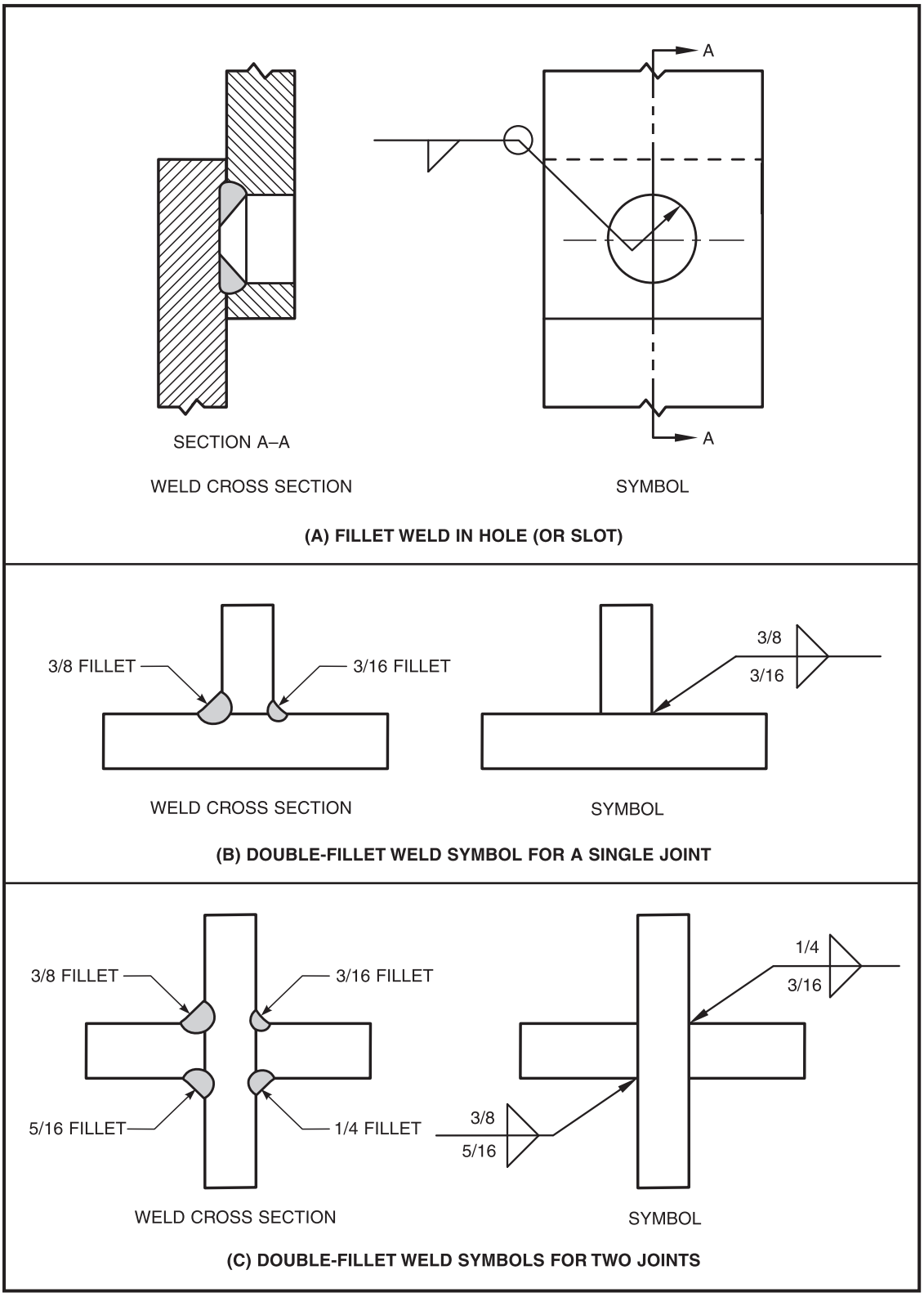
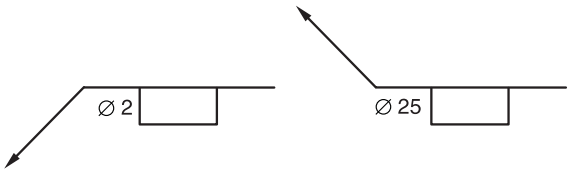


Figure 34—Application of the Fillet Weld Symbol

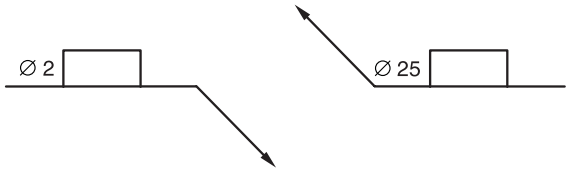
8. Plug Welds

8.1 General

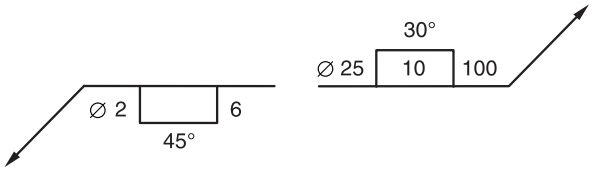
8.1.1 Arrow-Side Holes. Holes in the arrow-side member of a joint to be plug welded shall be specified by placing the plug weld symbol below the reference line [see Figure 35(A)].



8.1.2 Other-Side Holes. Holes in the other-side member of a joint to be plug welded shall be specified by placing the plug weld symbol above the reference line [see Figure 35(B)].

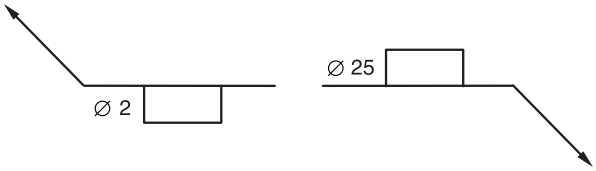


8.1.3 Dimensions. Dimensions of plug welds shall be specified on the same side of the reference line as the weld symbol (see Figure 36).

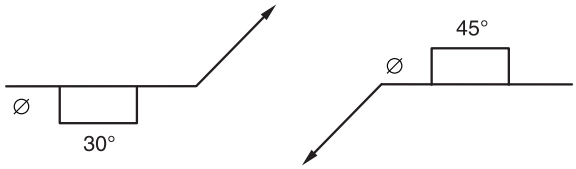


8.1.4 Fillets in Holes. The plug weld symbol shall not be used to designate fillet welds in holes (see 7.5).

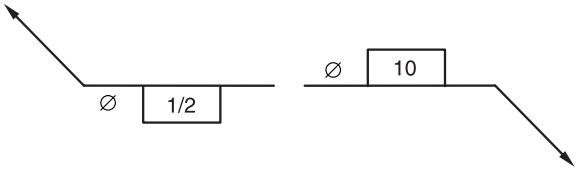
8.2 Plug Weld Size. The plug weld size shall be specified to the left of the plug weld symbol and shall be preceded by the diameter symbol, ∅, shown [see Figure 36(A), (E), (F), and (G)]. Plug weld size is the diameter of the hole at the faying surface.



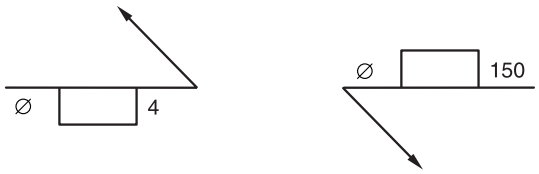
8.3 Angle of Countersink. The included angle of countersink of plug welds shall be located on the same side of the reference line and above or below the plug weld symbol as appropriate [see Figure 36(B) and (E)].



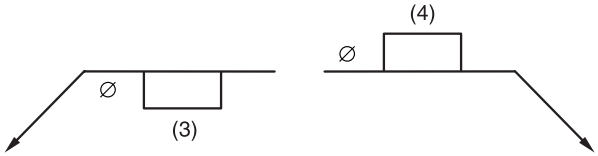
8.4 Depth of Filling. When the depth of filling is less than complete, it shall be specified inside the plug weld symbol [see Figure 36(C) and (E)]. The omission of a depth dimension shall specify complete filling [see Figure 36(A), (B), (D), (F), and (G)].



8.5 Spacing of Plug Welds. The pitch (center-to-center distance) of plug welds in a straight line shall be specified to the right of the plug weld symbol [see Figure 36(D) and (E)]. The spacing of plug welds in any configuration other than a straight line shall be dimensioned on the drawing.

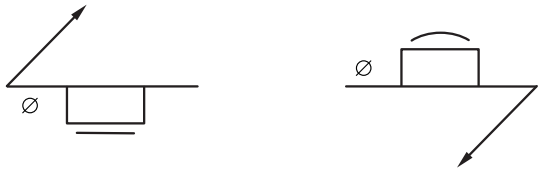


8.6 Number of Plug Welds. When a definite number of plug welds is desired in a joint, the number shall be specified in parentheses on the same side of the reference line as the weld symbol. The number shall be either above or below the weld symbol, as appropriate [see Figure 36(D) and (E)]. When the welding symbol also includes the angle of countersink, the number of plug welds shall be placed either above or below the angle of countersink, as appropriate [see Figure 36(E)].

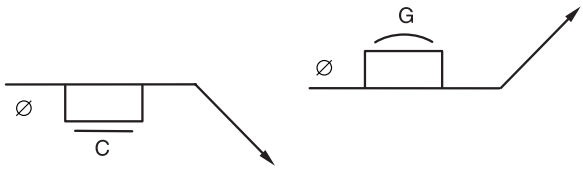


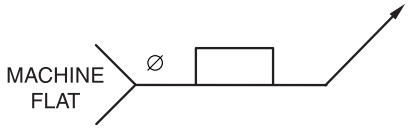
8.7 Contours and Finishing of Plug Welds

8.7.1 Contours Obtained by Welding. Plug welds that are to be welded with approximately flush or convex faces without postweld finishing shall be specified by adding the flush or convex contour symbol to the welding symbol (see 5.12.1).



8.7.2 Contours Obtained by Postweld Finishing. Plug welds whose faces are to be finished approximately flush or convex by postweld finishing shall be specified by adding both the appropriate contour symbol and finishing designator to the welding symbol (see 5.12.2). Welds that require a flat but not flush surface require an explanatory note in the tail of the welding symbol.





8.8 Joints Involving Three or More Members. Plug welding symbols may be used to specify the welding of two or more members to another member. A section view of the joint shall be provided to clarify which members require penetration [see Figure 36(F) and (G)].

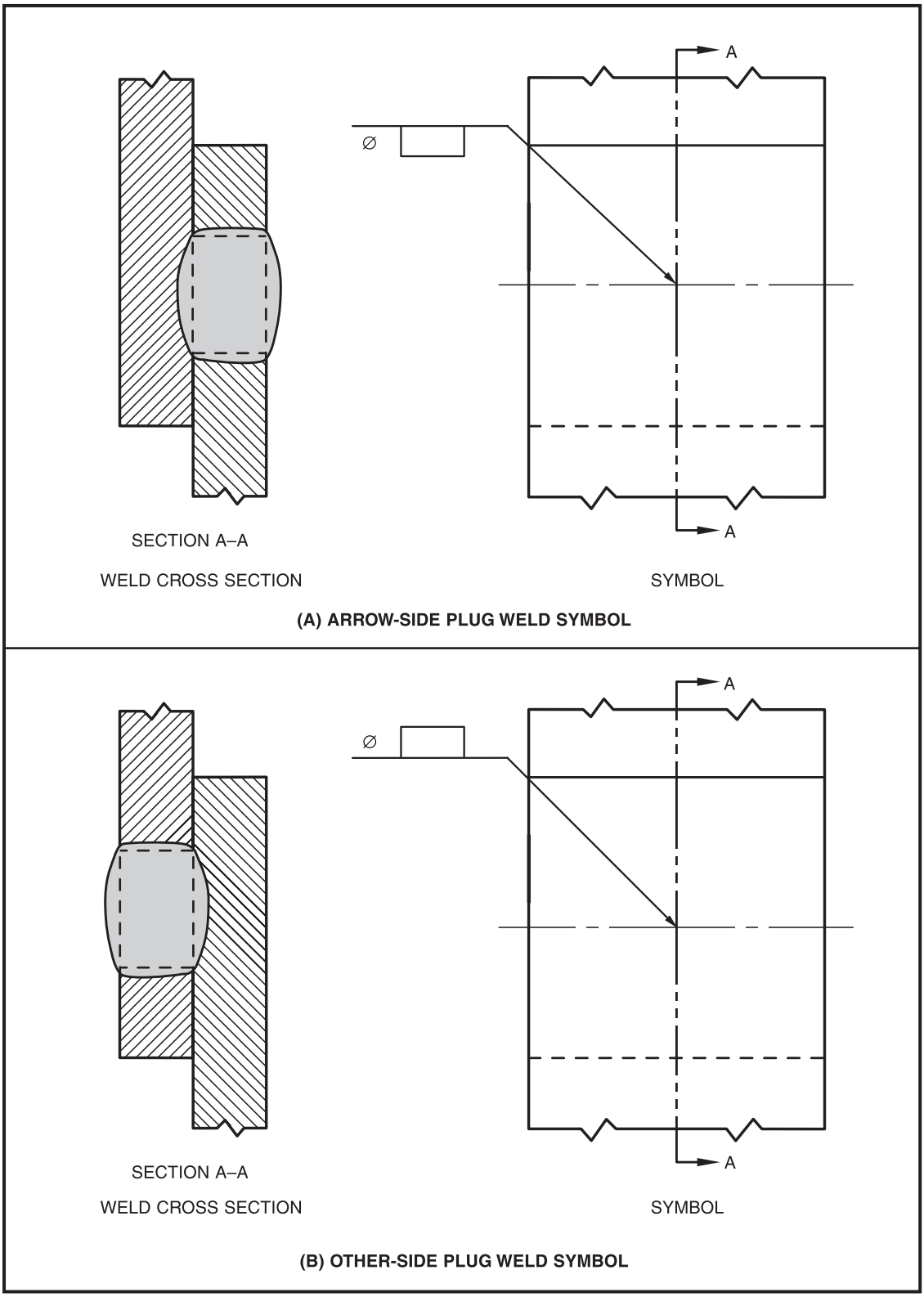


Figure 35—Application of the Plug Weld Symbol

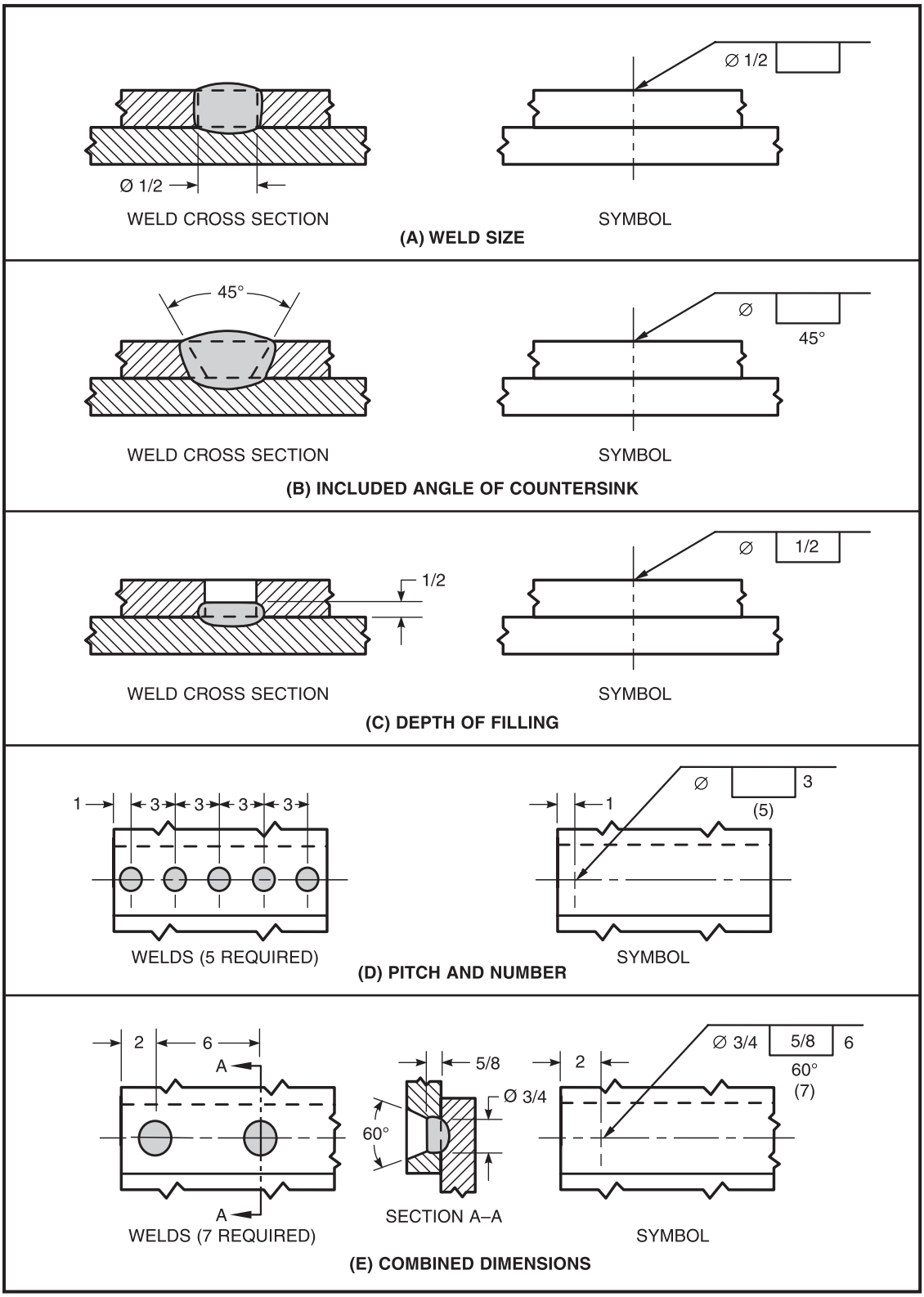


Figure 36—Application of Information to Plug Weld Symbols

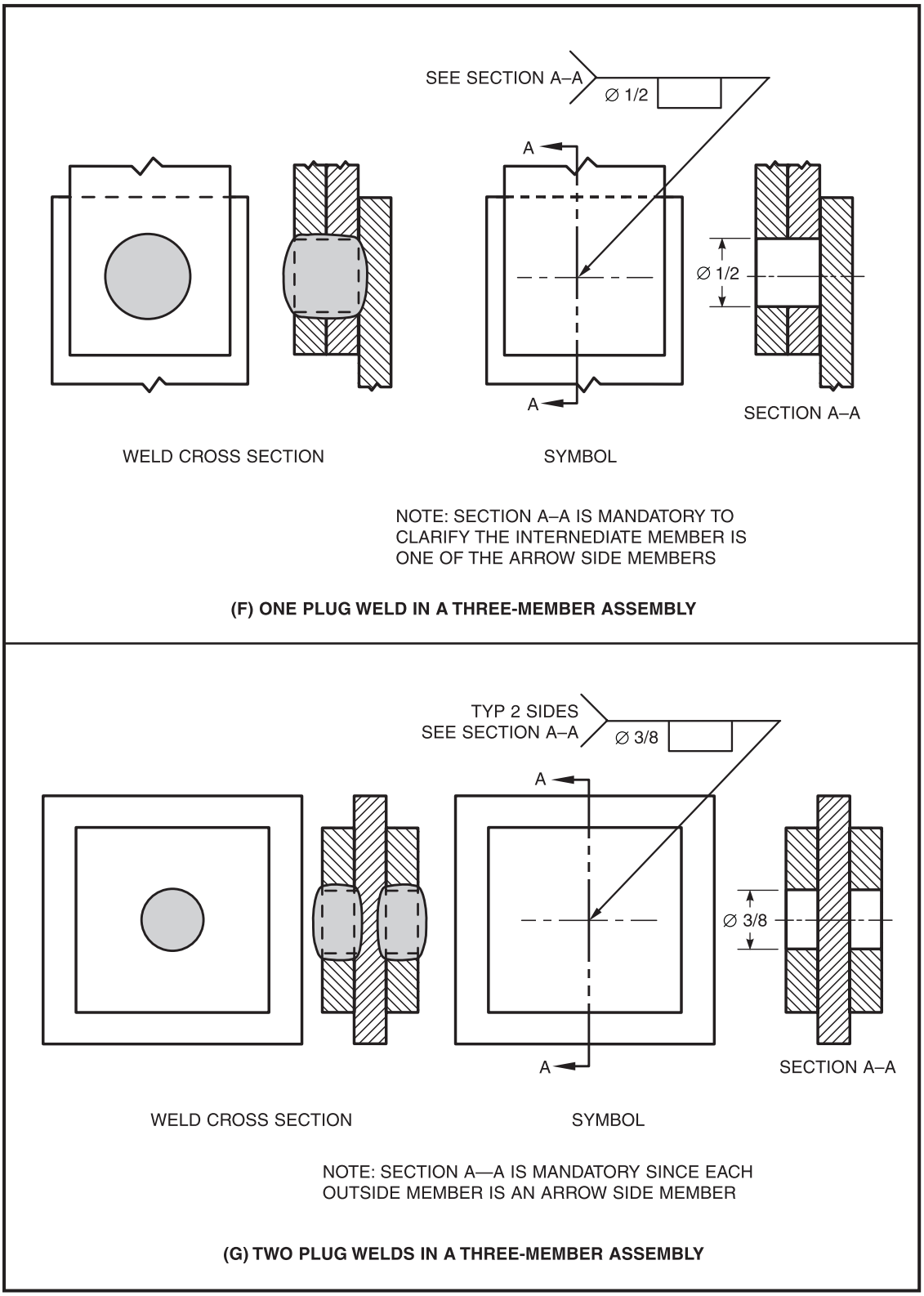


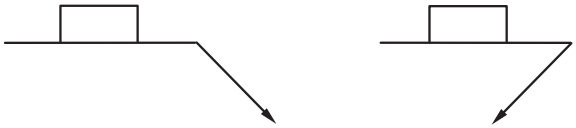
Figure 36 (Continued)—Application of Information to Plug Weld Symbols

9. Slot Welds

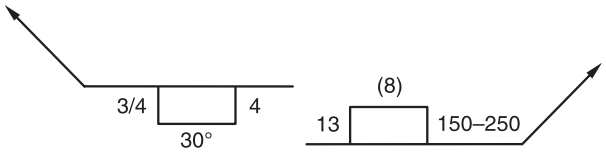
9.1 General

9.1.1 Arrow-Side Slots. Slots in the arrow-side member of a joint to be slot welded shall be specified by placing the slot weld symbol below the reference line [see Figure 37(A)].

9.1.2 Other-Side Slots. The slots in the other-side member of a joint to be slot welded shall be specified by placing the slot weld symbol above the reference line [see Figure 37(B)].

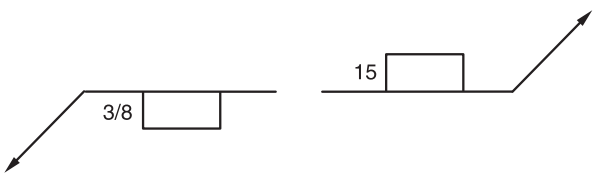


9.1.3 Dimensions. The dimensions of slot welds shall be specified on the same side of the reference line as the weld symbol (see Figure 38).

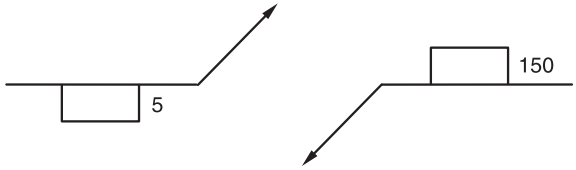


9.1.4 Fillets in Slots. The slot weld symbol shall not be used to specify fillet welds in slots (see 7.5).

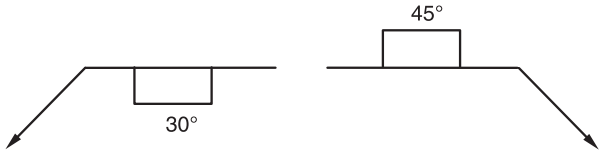
9.2 Width of Slot Welds. The width of a slot weld shall be specified to the left of the weld symbol (see Figure 38). The slot weld width is the dimension of the slot, measured in the direction of the minor axis at the faying surface.



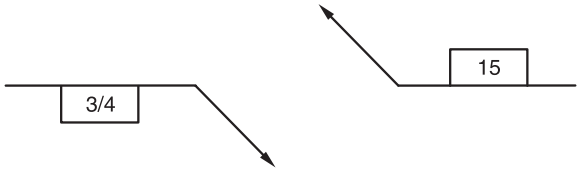
9.3 Length of Slot Welds. The length of slot welds shall be specified to the right of the weld symbol (see Figure 38). Slot weld length is the dimension of the slot, measured in the direction of the major axis at the faying surface.



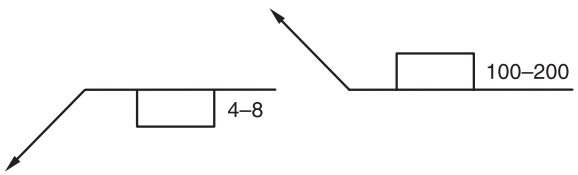
9.4 Angle of Countersink. The countersink included angle of slot welds shall be specified either above or below the slot weld symbol, as appropriate [see Figure 38(A)].



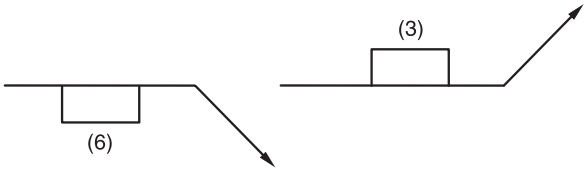
9.5 Depth of Filling. A depth of filling less than complete shall be specified inside the slot weld symbol [see Figure 38(B)]. The omission of the depth dimension shall specify complete filling [see Figure 38(A)].



9.6 Spacing of Slot Welds. The pitch (center-to-center distance) of slot welds in a straight line shall be specified to the right of the length dimension following a hyphen (see Figure 38).



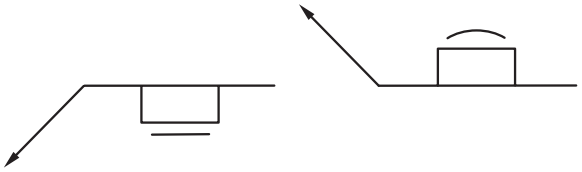
9.7 Number of Slot Welds. When a definite number of slot welds is desired in a joint, the number shall be specified in parentheses on the same side of the reference line as the weld symbol. The number shall be either above or below the weld symbol, as appropriate (see Figure 38). When the angle of countersink is also included in the welding symbol, the number of slot welds shall be placed above or below the angle of countersink, as appropriate [see Figure 38(A)].



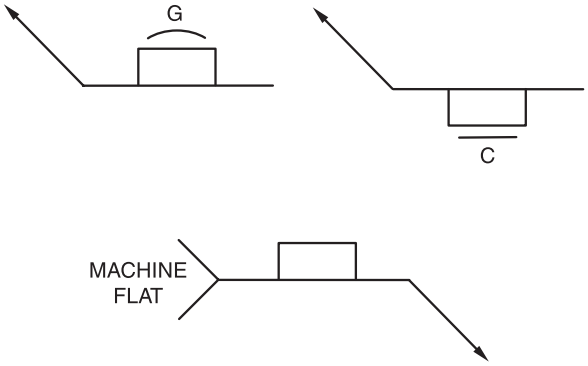
9.8 Location and Orientation of Slot Welds. The location and orientation of slot welds shall be specified on the drawing.

9.9 Contours and Finishing of Slot Welds

9.9.1 Contours Obtained by Welding. Slot welds that are to be welded with approximately flush or convex faces without postweld finishing shall be specified by adding the flush or convex contour symbol to the welding symbol (see 5.12.1).



9.9.2 Contours Obtained by Postweld Finishing. Slot welds whose faces are to be finished approximately flush or convex by postweld finishing shall be specified by adding both the appropriate contour symbol and finishing designator to the welding symbol (see 5.12.2). Welds that require a flat but not flush surface require an explanatory note in the tail of the welding symbol.



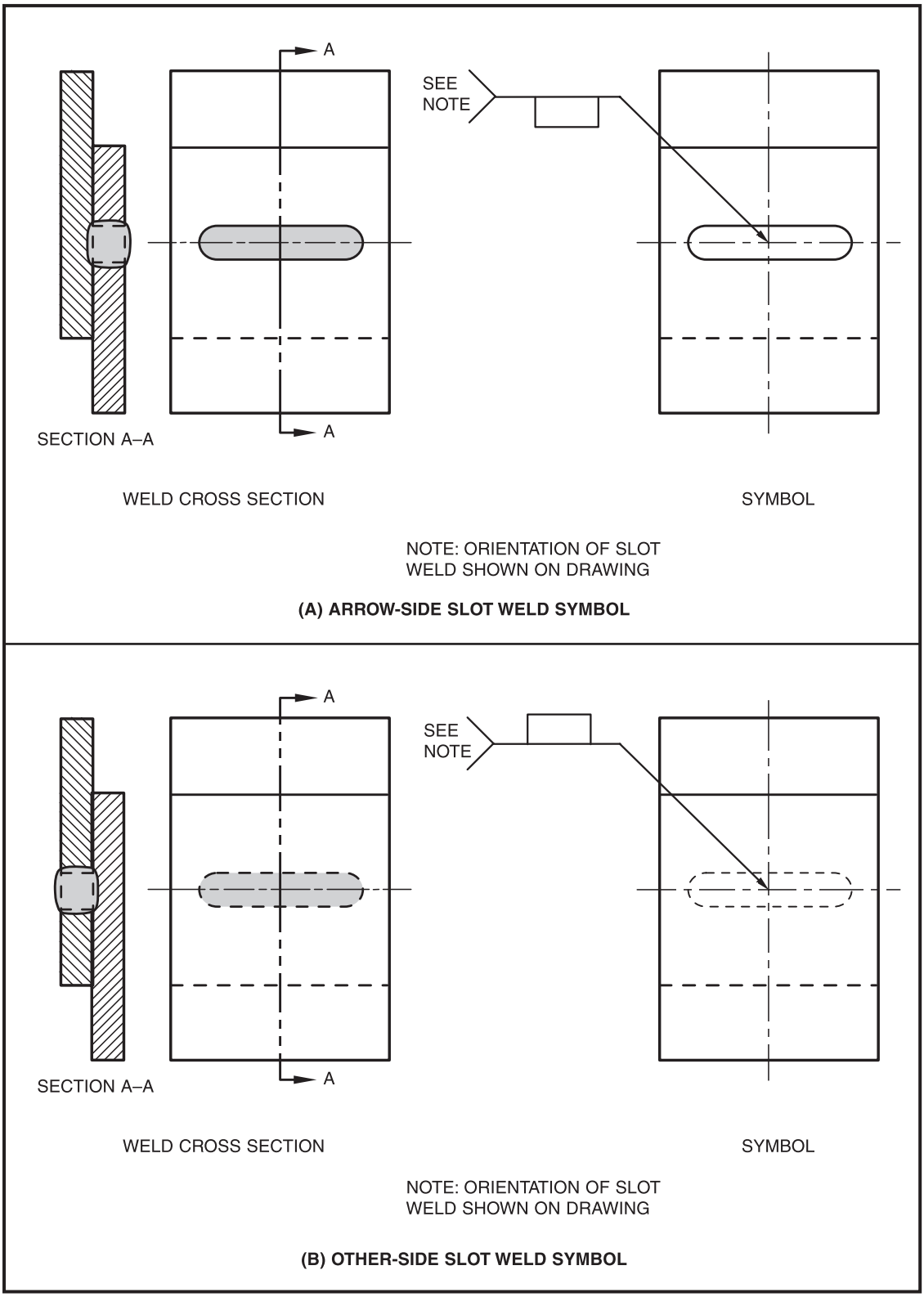


Figure 37—Application of the Slot Weld Symbol

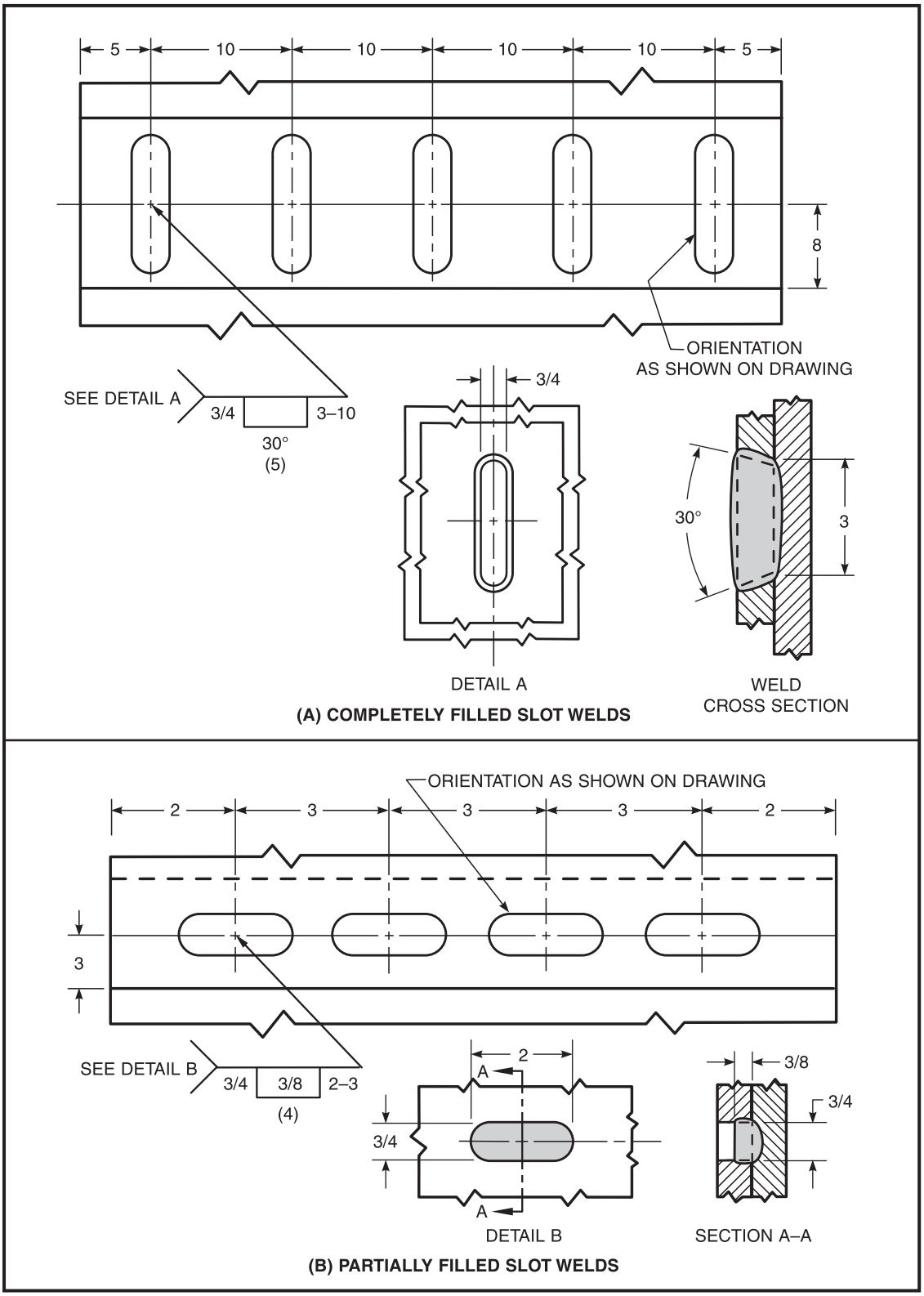


Figure 38—Application of Information to Slot Weld Symbols

10. Spot Welds

10.1 General

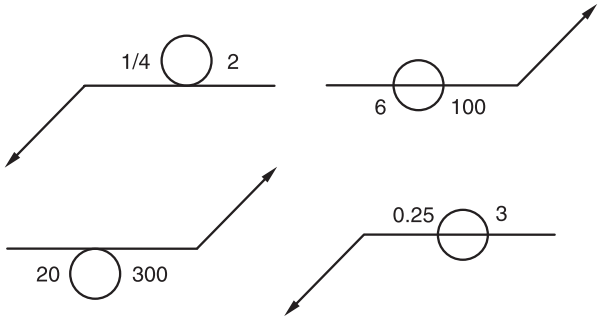
10.1.1 Arrow-Side or Other-Side Significance. The spot weld symbol, relative to its location on the reference line, may or may not have arrow-side-member or other-side-member significance (see 5.1.2, 5.1.3, and Figure 39).

10.1.1.1 Arrow-Side Member. For those welding processes for which arrow-side-member significance is applicable, the arrow-side member shall be indicated by placing the spot weld symbol below the reference line with the arrow pointing to this member [see Figures 1 and 39(A)].

10.1.1.2 Other-Side Member. For those welding processes for which other-side-member significance is applicable, the other-side member shall be indicated by placing the spot weld symbol above the reference line [see Figure 39(B)].

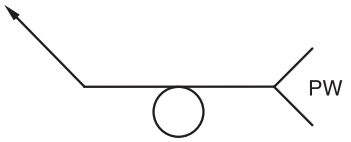
10.1.1.3 No Side Significance. For those welding processes for which no arrow-side or other-side significance is applicable, the spot weld symbol shall be centered on the reference line [see 5.1.3 and Figure 39(C)].

10.1.2 Dimension Location. Dimensions shall be specified on the same side of the reference line as the spot weld symbol, or all dimensions shall be shown on either side when the spot weld symbol has no arrow-side or other-side significance (see Figures 39 and 40).



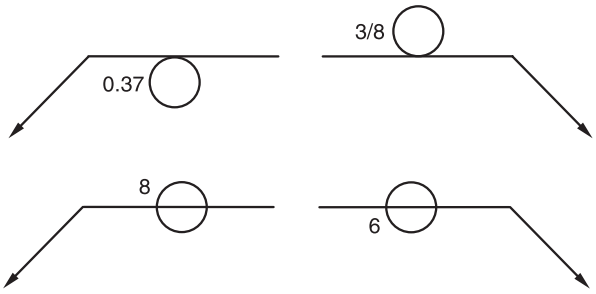
10.1.3 Welding Process Reference. The process reference shall be indicated in the tail of the welding symbol (see 5.11.1 and Figures 39 and 40).

10.1.4 Projection Welds. The projection weld symbol shall be used with the projection welding process reference in the tail of the welding symbol. The projection weld symbol shall be placed above or below (not centered on) the reference line to designate which member receives the embossment in accordance with the location conventions given in 5.1.2 (see Figure 41).

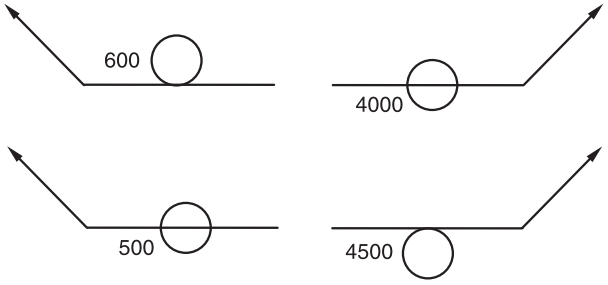


10.2 Size or Strength of Spot Welds. Spot welds shall be specified by either size or strength to the left of the spot weld symbol as follows:

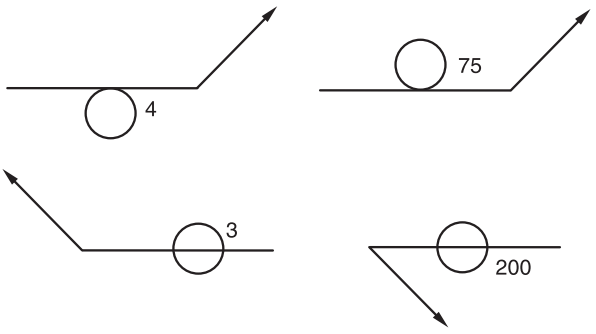
10.2.1 Size. The size of a spot weld shall be specified, in inches or millimeters, as the diameter of the weld at the faying surfaces of the members [see Figure 40(A)].



10.2.2 Strength. The shear strength of a spot weld shall be specified in pounds or newtons [see Figure 40(B)].

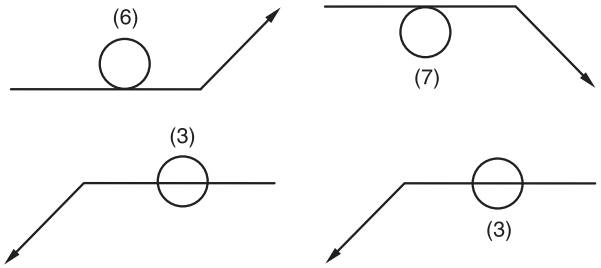


10.3 Spacing of Spot Welds. The pitch (center-to-center distance) of spot welds in a straight line shall be specified to the right of the weld symbol [see Figure 40(C)].

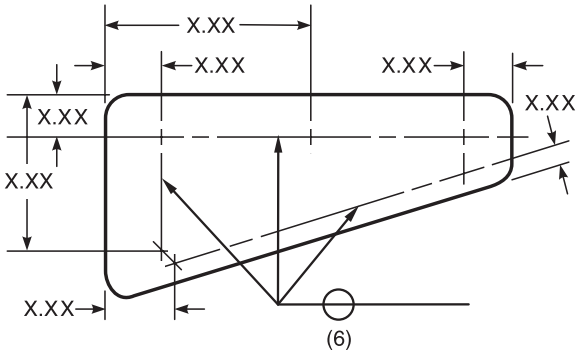


10.4 Number of Spot Welds

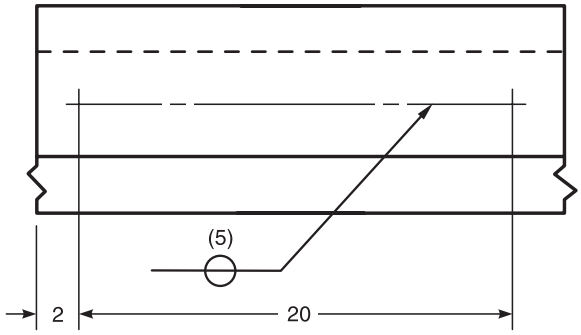
10.4.1 Number Specified. When a definite number of spot welds is desired in a joint, the number shall be specified in parentheses on the same side of the reference line as the spot weld symbol. The number may be either above or below the weld symbol when there is no other-side-member significance and the symbol is centered on the reference line [see Figure 40(C), (D), (E), and (F)].



10.4.2 Grouped Spot Welds. A group of spot welds may be located on a drawing by intersecting centerlines. The arrow shall point to at least one of the centerlines passing through each weld location. When spot welds are to be randomly located in a group, the area in which they are to be applied shall be clearly indicated [see Figure 40(E)].



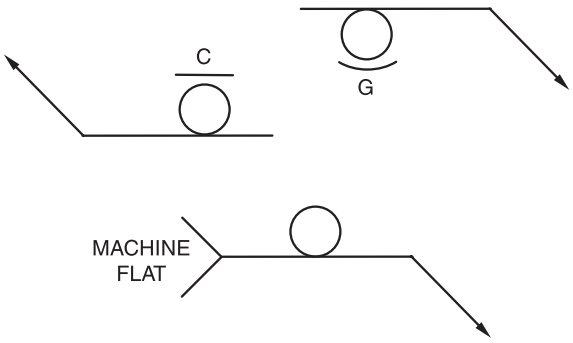
10.5 Extent of Spot Welding. When spot welds extend less than the distance between abrupt changes in the direction of welding, or less than the full length of the joint (see 5.9), the desired extent shall be dimensioned on the drawing [see Figure 40(D)].



10.6 Contours and Finishing of Spot Welds

10.6.1 Contours Obtained by Welding. When the exposed surface of either member in a spot welded joint is to be welded with approximately a flush or convex face without postweld finishing, that surface shall be specified by adding the flush or convex contour symbol to the welding symbol (see 5.12.1).

10.6.2 Contours Obtained by Postweld Finishing. Spot welds whose faces are to be finished approximately flush or convex by postweld finishing, shall be specified by adding both the appropriate contour symbol and finishing designator to the welding symbol (see 5.12.2). Welds that require a flat but not flush surface require an explanatory note in the tail of the welding symbol.



10.7 Multiple-Member Spot Welds. When one or more members are included between the two outer members in a spot welded joint, the spot weld symbol for the two outer members shall be used (see Figure 42).

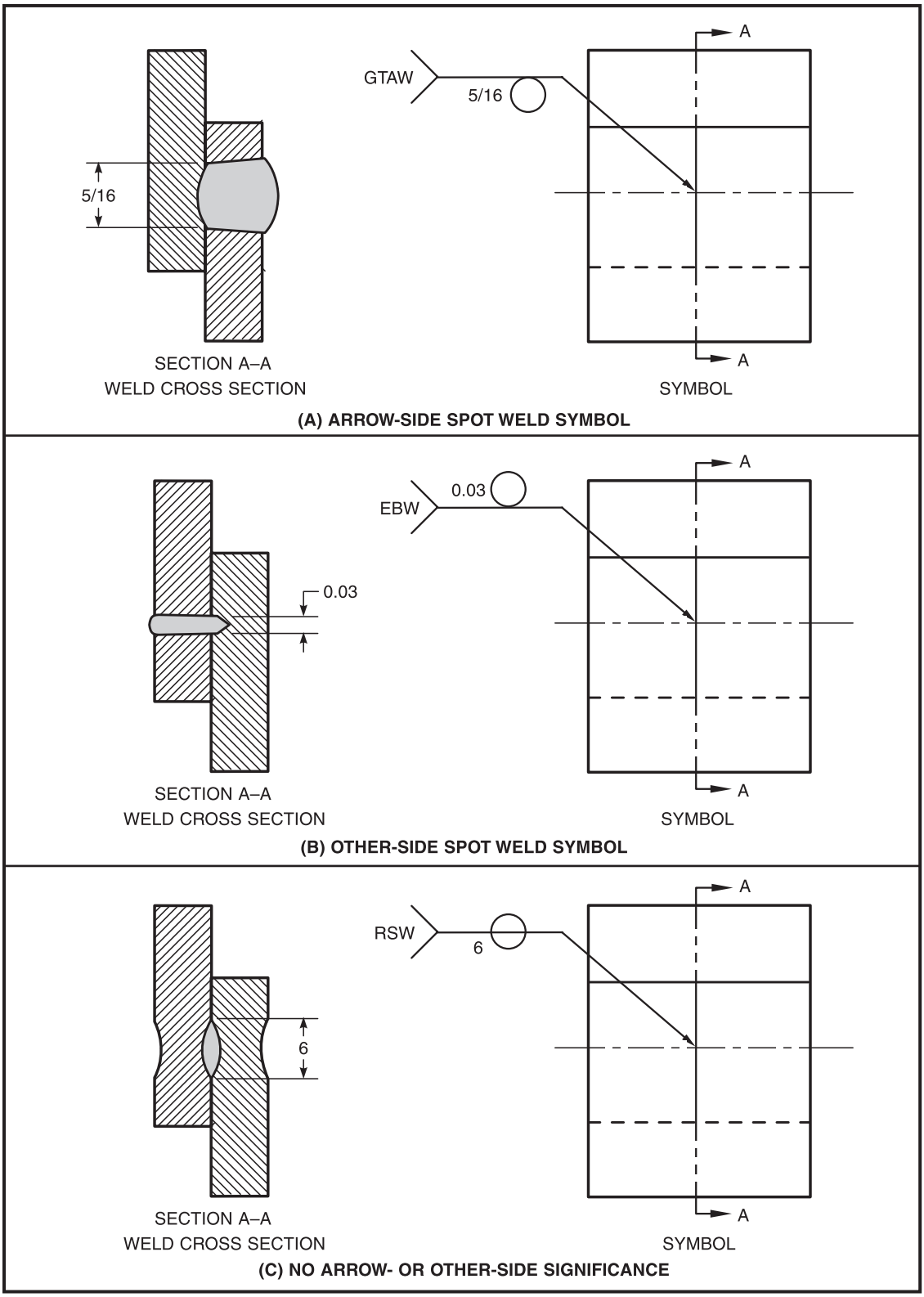


Figure 39—Application of the Spot Weld Symbol

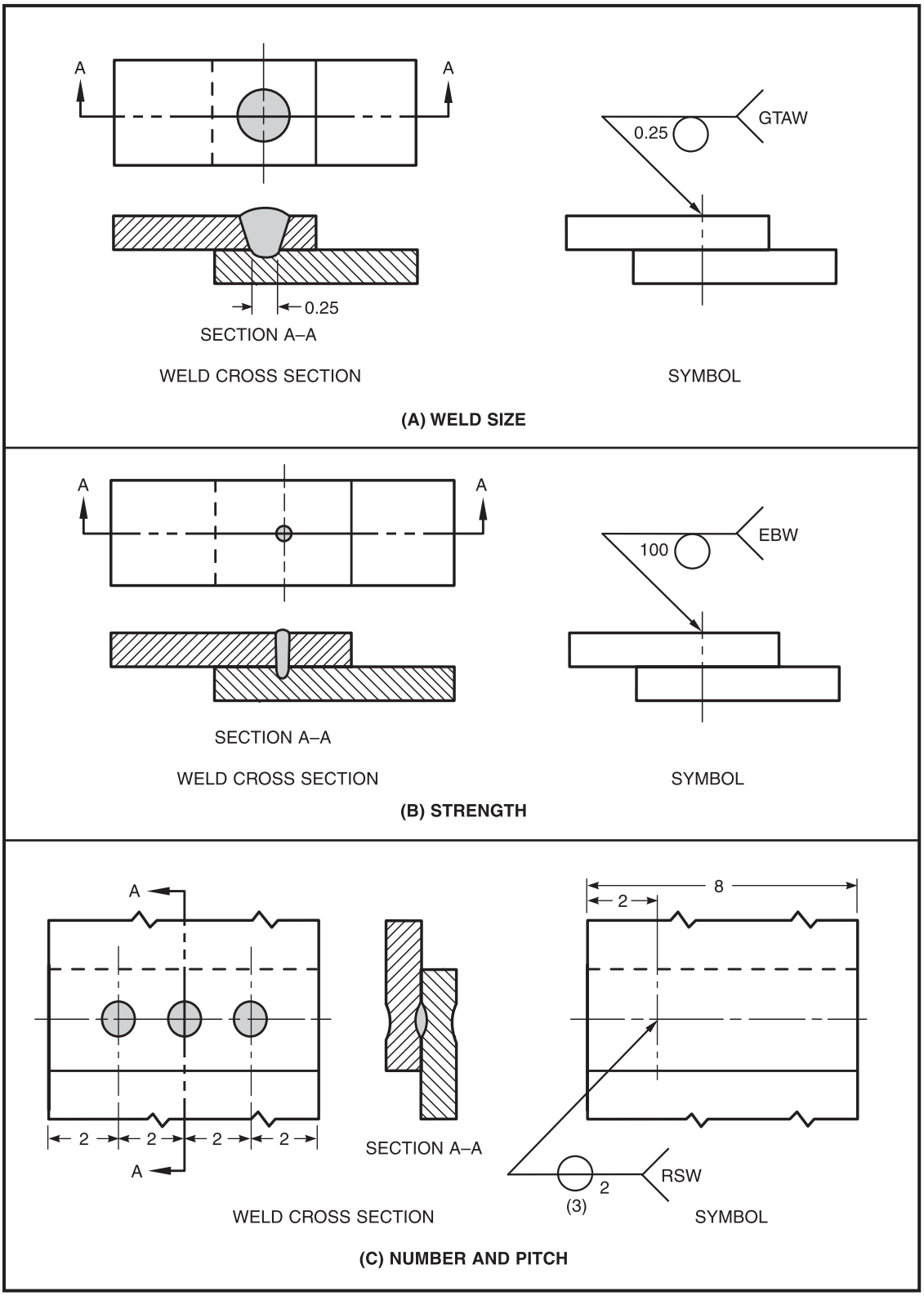


Figure 40—Application of Information to the Spot Weld Symbol

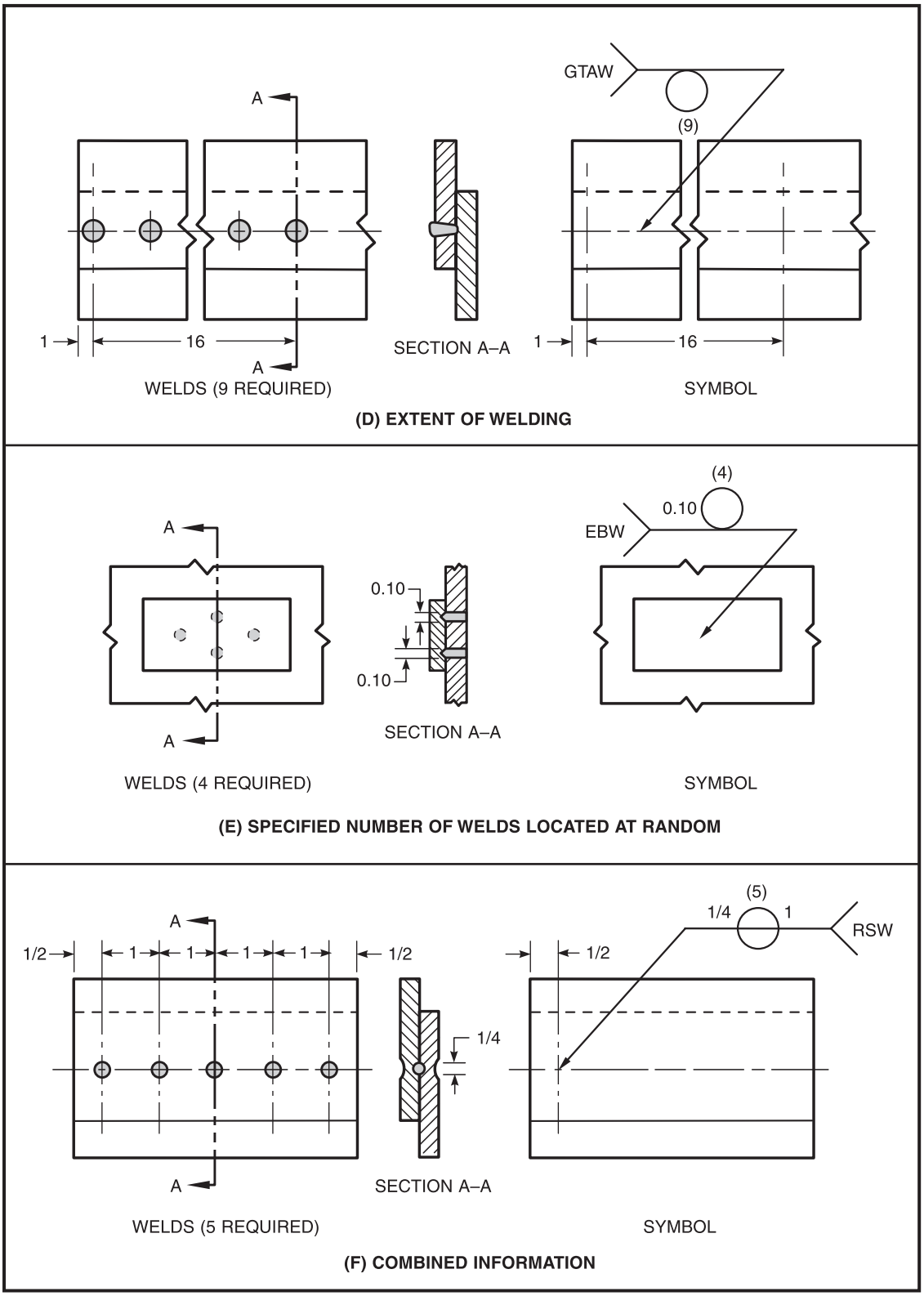


Figure 40 (Continued)—Application of Information to the Spot Weld Symbol

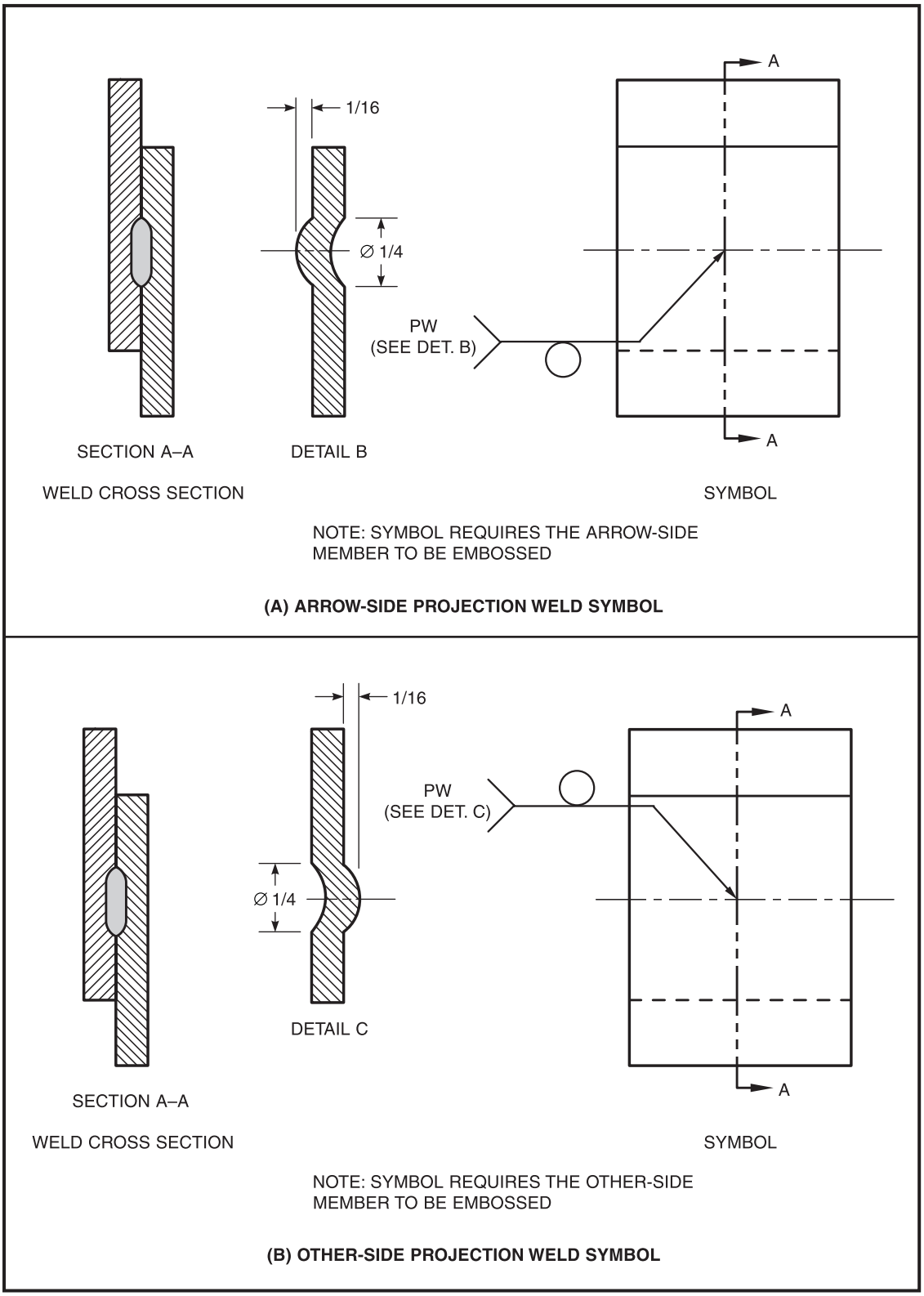


Figure 41—Application of the Projection Weld Symbol

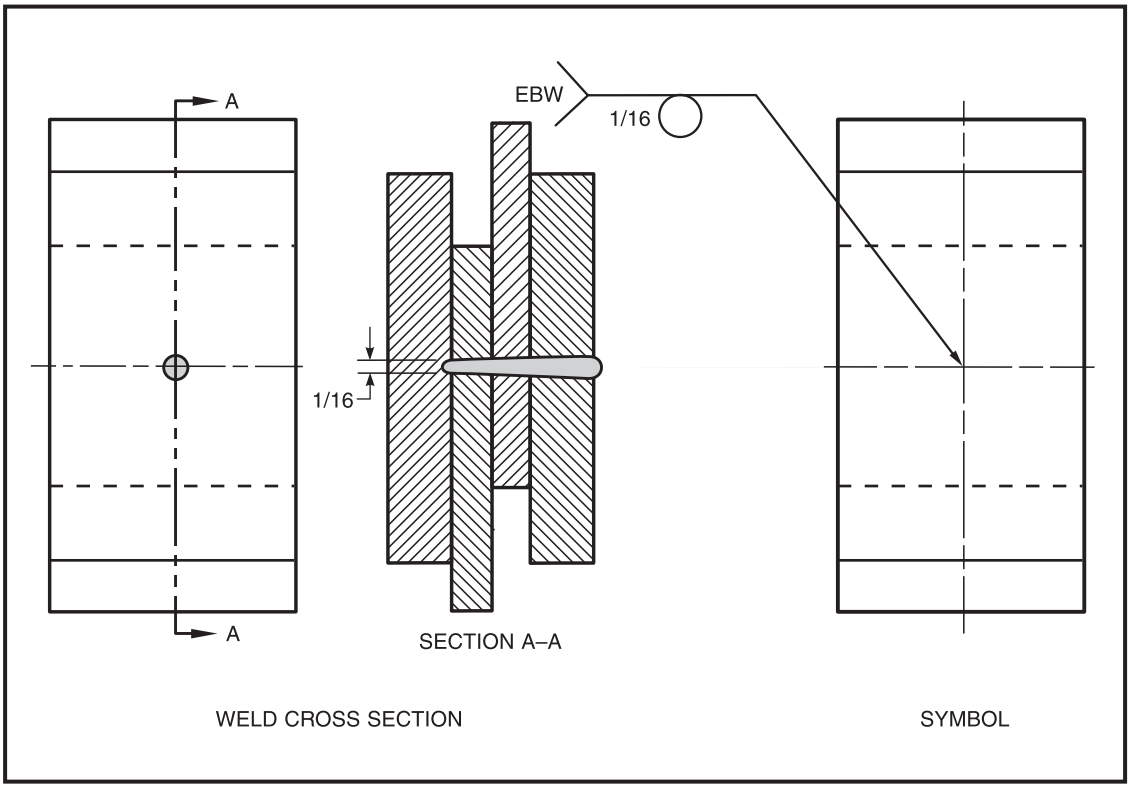


Figure 42—Multiple-Member Spot Weld

11. Seam Welds

11.1 General

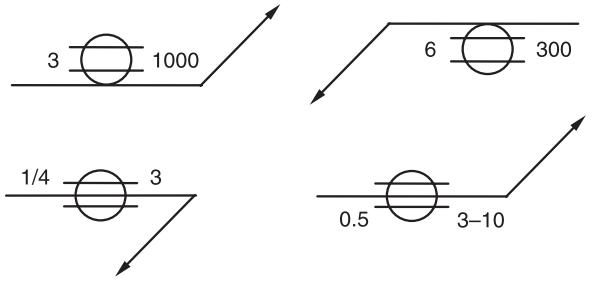
11.1.1 Arrow-Side, Other-Side Significance. The seam weld symbol, relative to its location on the reference line, may or may not have arrow-side-member or other-side-member significance (see 5.1.2, 5.1.3, and Figure 43).

11.1.1.1 Arrow-Side Member. For those welding processes for which arrow-side-member significance is applicable, the arrow-side member shall be indicated by placing the seam weld symbol below the reference line with the arrow pointing to this member [see Figures 1 and 43(A)].

11.1.1.2 Other-Side Member. For those welding processes for which other-side significance is applicable, the other-side member shall be indicated by placing the seam weld symbol above the reference line [see Figure 43(B)].

11.1.1.3 No Side Significance. For those welding processes for which no arrow-side or other-side significance is applicable, the seam weld symbol shall be centered on the reference line [see 5.1.3 and Figure 43(C)].

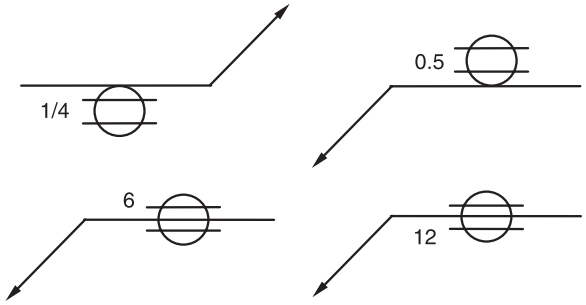
11.1.2 Dimension Location. Dimensions shall be shown on the same side of the reference line as the weld symbol, or all dimensions shall be shown on either side when the seam weld symbol has no arrow-side or other-side significance (see Figure 44).



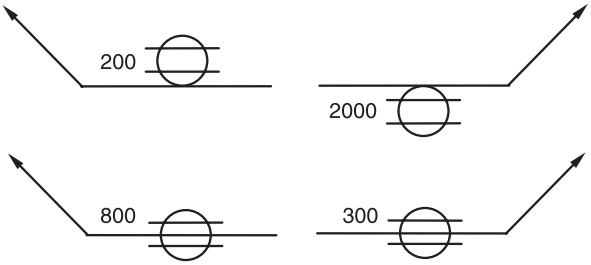
11.1.3 Welding Process Reference. The process reference shall be indicated in the tail of the welding symbol (see 5.11.1 and Figures 43 through 45).

11.2 Size and Strength of Seam Welds. Seam welds shall be specified by either size or strength to the left of the seam weld symbol as follows:

11.2.1 Size. The size of a seam weld shall be specified, in inches or millimeters, as the width of the weld at the faying surfaces of the members [see Figure 44(A), (C), and (D)].

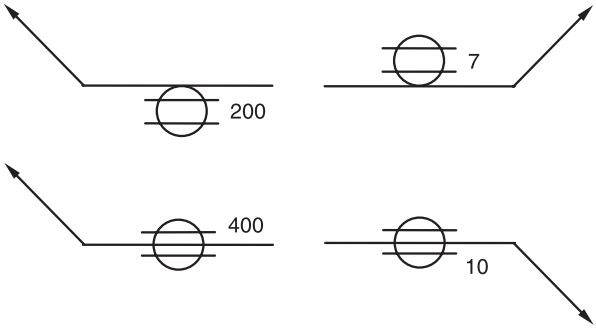


11.2.2 Strength. The shear strength of a seam weld shall be specified in pounds per linear inch or in newtons per millimeter [see Figure 44(B)].



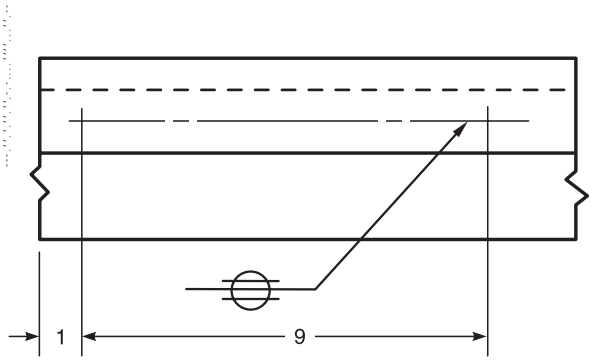
11.3 Length of Seam Welds

11.3.1 Dimension Location. The length of a seam weld shall be specified to the right of the weld symbol [see Figure 44(A) and (D)].



11.3.2 Abrupt Changes. When a seam weld extends the full distance between abrupt changes in the direction of welding (see 5.9), no length dimension need be specified on the welding symbol.

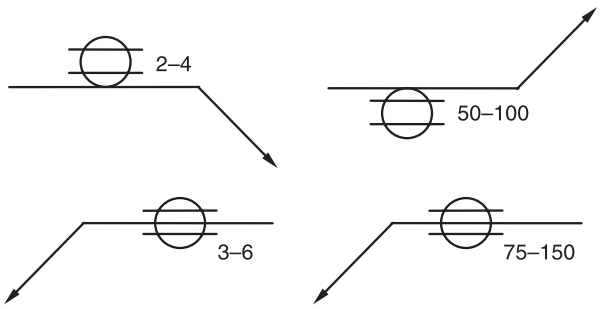
11.3.3 Specific Lengths. When a seam weld extends less than the distance between abrupt changes in the direction of welding or less than the full length of the joint, the extent shall be dimensioned on the drawing [see 5.9 and Figure 44(C)].



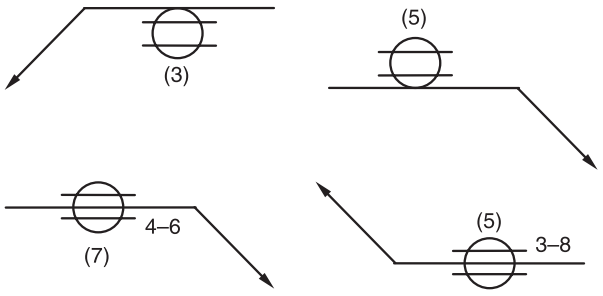
11.4 Dimensions of Intermittent Seam Welds

11.4.1 Pitch. The pitch of intermittent seam welds shall be specified as the distance between centers of the weld segments [see Figure 44(A) and (D)].

11.4.2 Pitch Dimension Location. The pitch of intermittent seam welds shall be specified to the right of the length dimension following a hyphen [see Figure 44(A) and (D)].



11.5 Number of Seam Welds. When a definite number of seam welds is desired in a joint, the number shall be specified in parentheses on the same side of the reference line as the weld symbol. The number shall be either above or below the weld symbol, as appropriate [see Figure 44(D)].



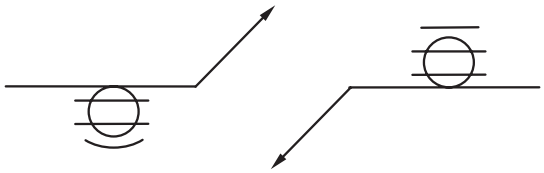
11.6 Orientation of Seam Welds

11.6.1 Intermittent Welds. Unless otherwise indicated, intermittent seam welds shall be interpreted as having length and pitch measured parallel to the weld axis [see Figure 44(A)].

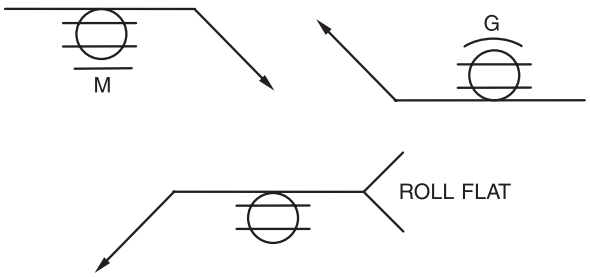
11.6.2 Showing Orientation. When the orientation of seam welds is not as in 11.6.1, a detailed drawing shall be used to specify the weld orientation [see Figure 44(D)].

11.7 Contours and Finishing of Seam Welds

11.7.1 Contours Obtained by Welding. When the exposed surface of either member in a seam welded joint is to be welded with approximately a flush or convex face without postweld finishing, that surface shall be specified by adding the flush or convex contour symbol to the welding symbol (see 5.12.1).



11.7.2 Contours Obtained by Postweld Finishing. Seam welds whose faces are to be finished approximately flush or convex by postweld finishing, shall be specified by adding both the appropriate contour symbol and finishing designator to the welding symbol (see 5.12.2). Welds that require a flat but not flush surface require an explanatory note in the tail of the welding symbol.



11.8 Multiple-Member Seam Welds. When one or more members are included between the two outer members in a seam welded joint, the seam weld symbol for the two outer members shall be used (see Figure 45).

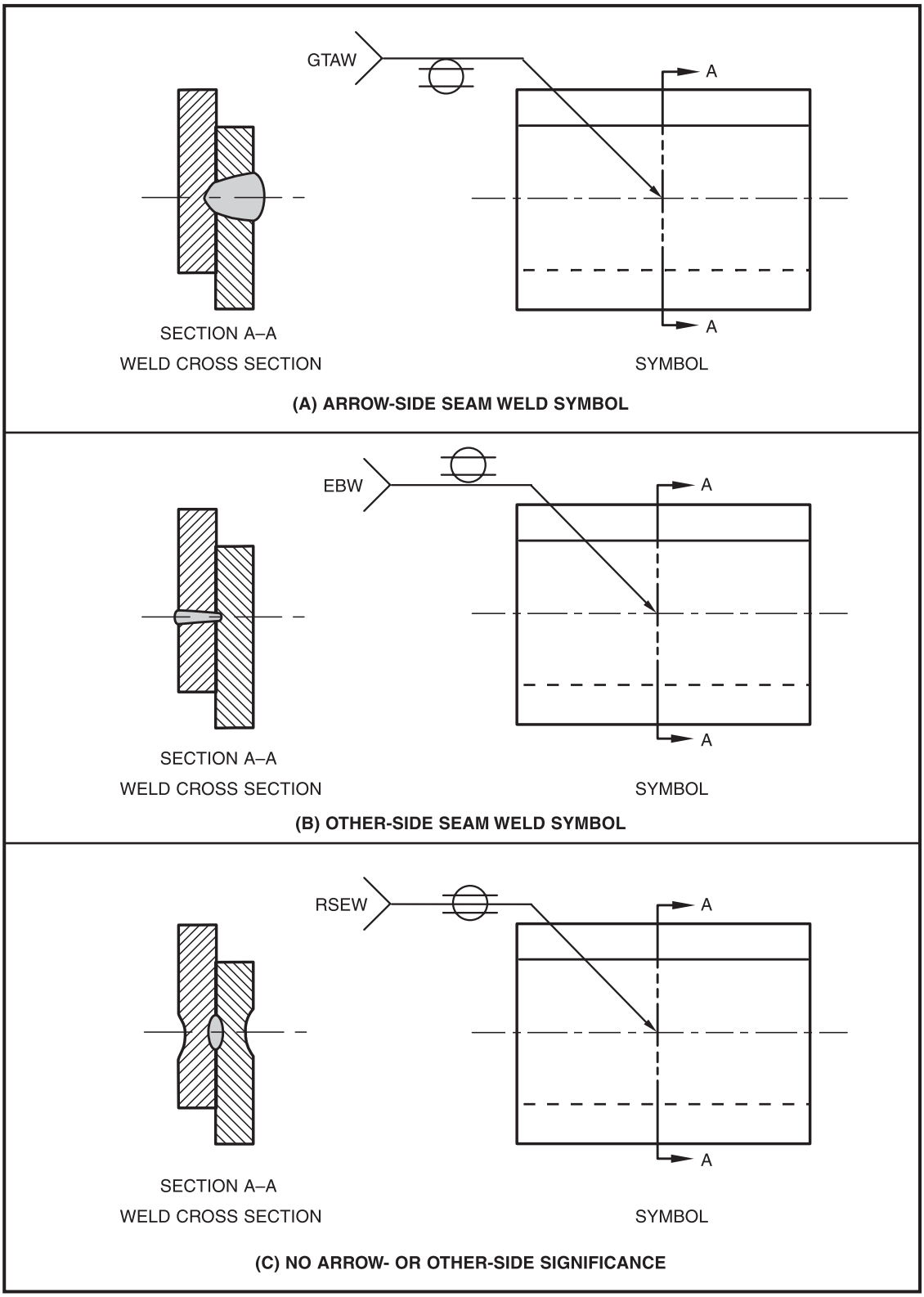


Figure 43—Application of the Seam Weld Symbol

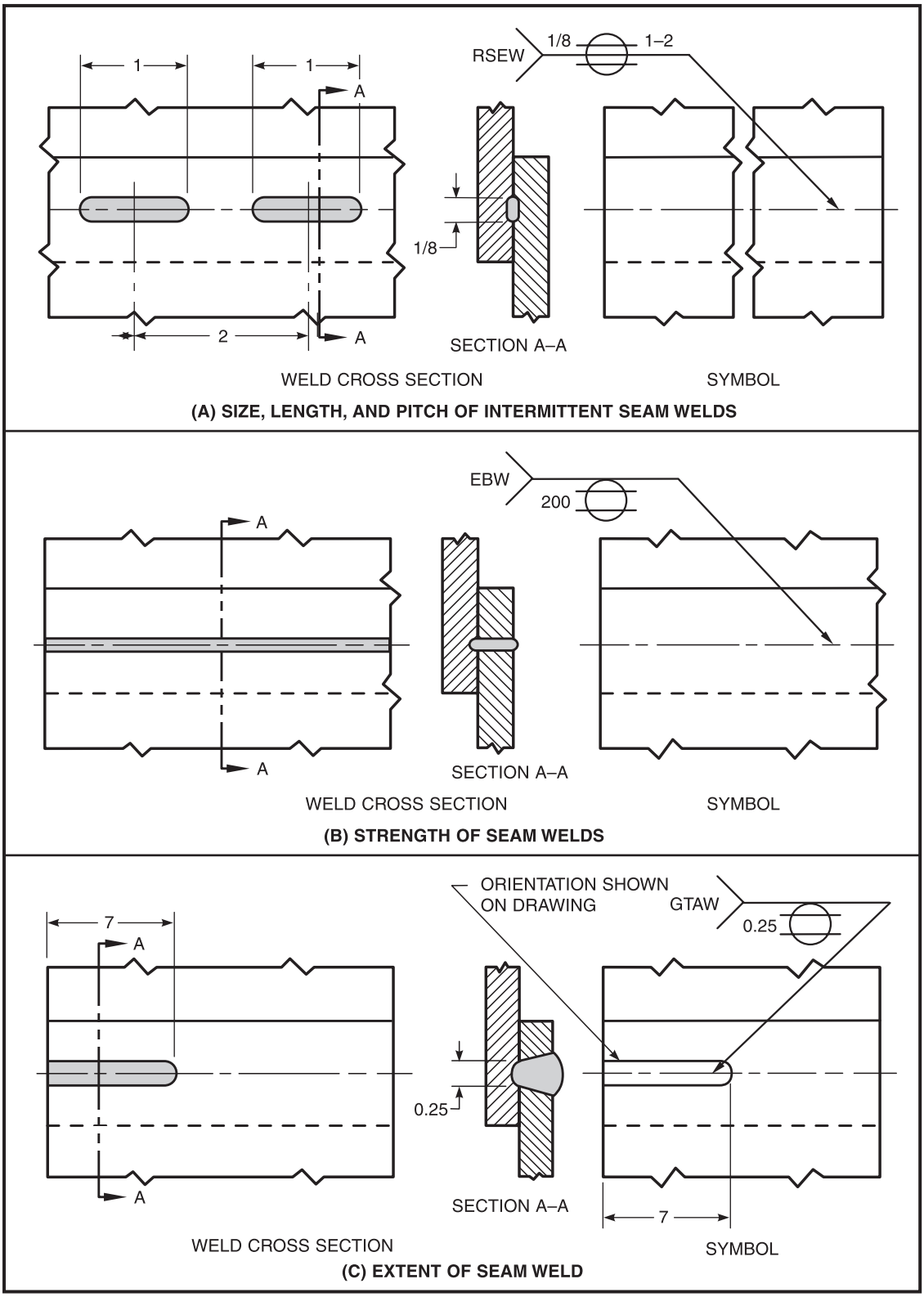


Figure 44—Application of Information to the Seam Weld Symbol

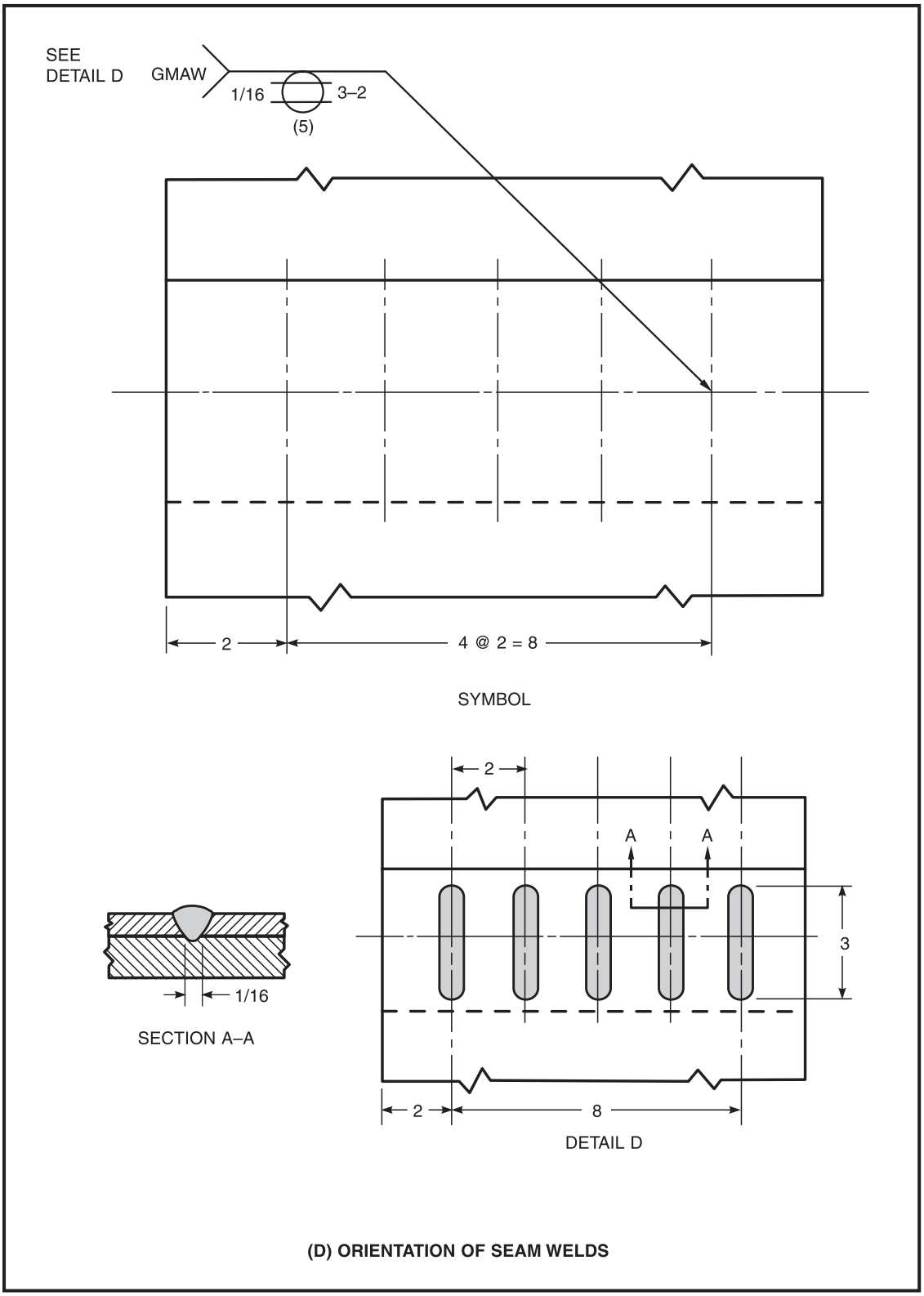


Figure 44 (Continued)—Application of Information to the Seam Weld Symbol

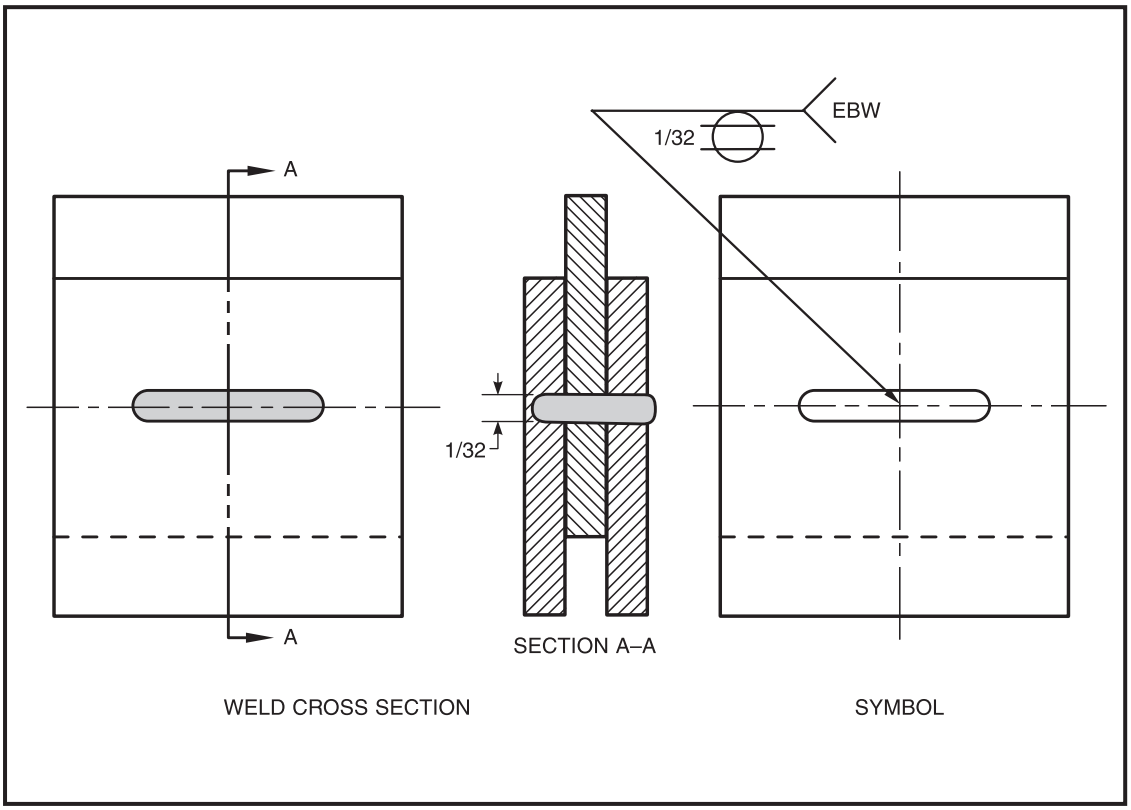


Figure 45—Multiple-Member Seam Weld

12. Edge Welds

12.1 General. The edge weld symbol is used to specify edge welds on edge joints and flanged butt or flanged corner joints. The full thickness of the joint members must be fused. Flange dimensions are considered part of the drawing and are not specified by the welding symbol (see Figure 46).

12.2 Edge Weld Size. When specified, the edge weld size shall be indicated by a dimension placed to the left of the edge weld symbol and on the same side of the reference line. If a specific edge weld size is not required, the dimension may be omitted [see Figure 46(A) and (B)].

12.3 Single- and Double-Edge Welds. Single-edge welds may be specified on edge, flanged butt, and flanged corner joints [see Figure 46(B), (C), and (D)]. Double-edge welds are only applicable to edge joints [see Figure 46(A)]. An edge weld may be combined with a flare-bevel or flare-V groove weld if welds are required on both sides of a flanged butt or flanged corner joint (see 6.2.10).

12.4 Edge Welds Requiring Complete Joint Penetration. Edge welds requiring complete joint penetration shall be specified for either flanged butt or flanged corner joints by the edge weld symbol with the melt-through symbol placed on the opposite side of the reference line [see Figure 46(E), (F), and (I)]. No size specification for the edge weld is necessary when combined with the melt-through symbol.

12.5 Edge Welds on Joints with More Than Two Members. Edge welds can be specified for edge joints, flanged butt joints, or flanged corner joints having more than two members by using the edge weld symbol in the same manner as for joints having two members [see Figure 46(G), (H), and (I)].

12.6 Length of Edge Welds

12.6.1 Location. The length of an edge weld, when indicated on the welding symbol, shall be specified to the right of the weld symbol.

12.6.1.1 Full Length. When an edge weld is to extend for the full length of the joint, no length dimension need be specified on the welding symbol.

12.6.1.2 Specific Lengths. Specific lengths of edge welds and their location may be specified by symbols in conjunction with dimension lines.

12.6.1.3 Hatching. Hatching may be used to graphically depict edge welds.

12.6.2 Changes in the Direction of Welding. Symbols for edge welds involving changes in direction of welding shall be in accordance with 5.9.2.

12.7 Intermittent Edge Welds

12.7.1 Pitch. The pitch of intermittent edge welds shall be the distance between the centers of adjacent weld segments on one side of the joint.

12.7.2 Pitch Dimension Location. The pitch of intermittent edge welds shall be specified to the right of the length dimension following a hyphen.

12.7.3 Chain Intermittent Edge Welds. The dimensions of chain intermittent edge welds shall be specified on both sides of the reference line. The segments of chain intermittent edge welds shall be opposite one another across the joint.

12.7.4 Staggered Intermittent Edge Welds. The dimensions of staggered intermittent edge welds shall be specified on both sides of the reference line, and the edge weld symbols shall be offset on opposite sides of the reference line. The segments of staggered intermittent edge welds shall be spaced symmetrically on both sides of the joint.

12.7.5 Extent of Welding. In the case of intermittent edge welds, additional weld lengths that are intended at the ends of the joint shall be specified by separate welding symbols and dimensioned on the drawing. When no weld lengths are intended at the ends of the joint, the unwelded lengths should not exceed the clear distance between weld segments and be so dimensioned on the drawing.

12.7.6 Location of Intermittent Welds. When the location of intermittent welds is not obvious, such as on a circular weld joint, it will be necessary to provide specific segment locations by the use of dimension lines (see 6.4.1.2 and 7.3.1.2) or by hatching (see 6.4.1.3 and 7.3.1.3).

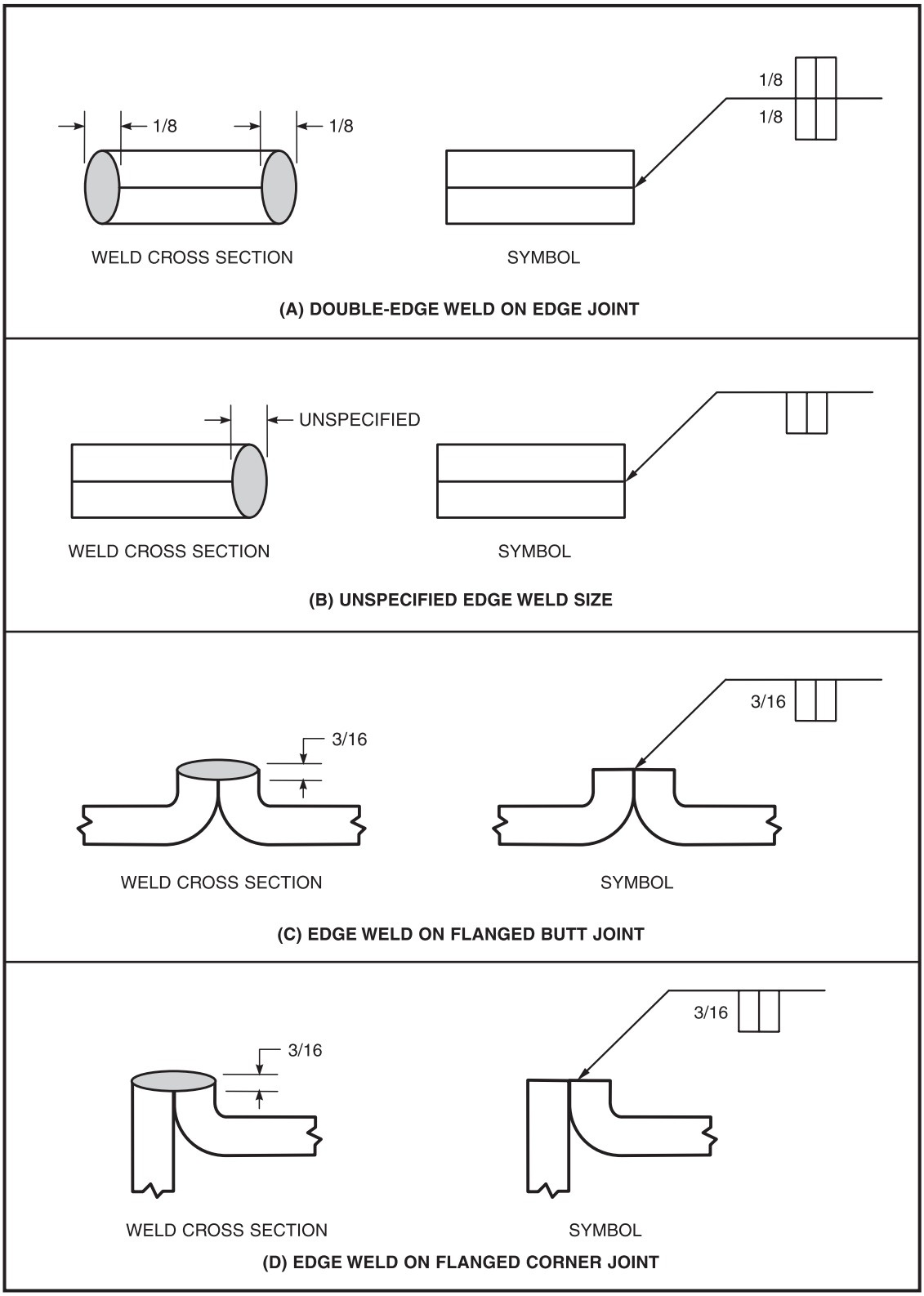


Figure 46—Application of the Edge Weld Symbol

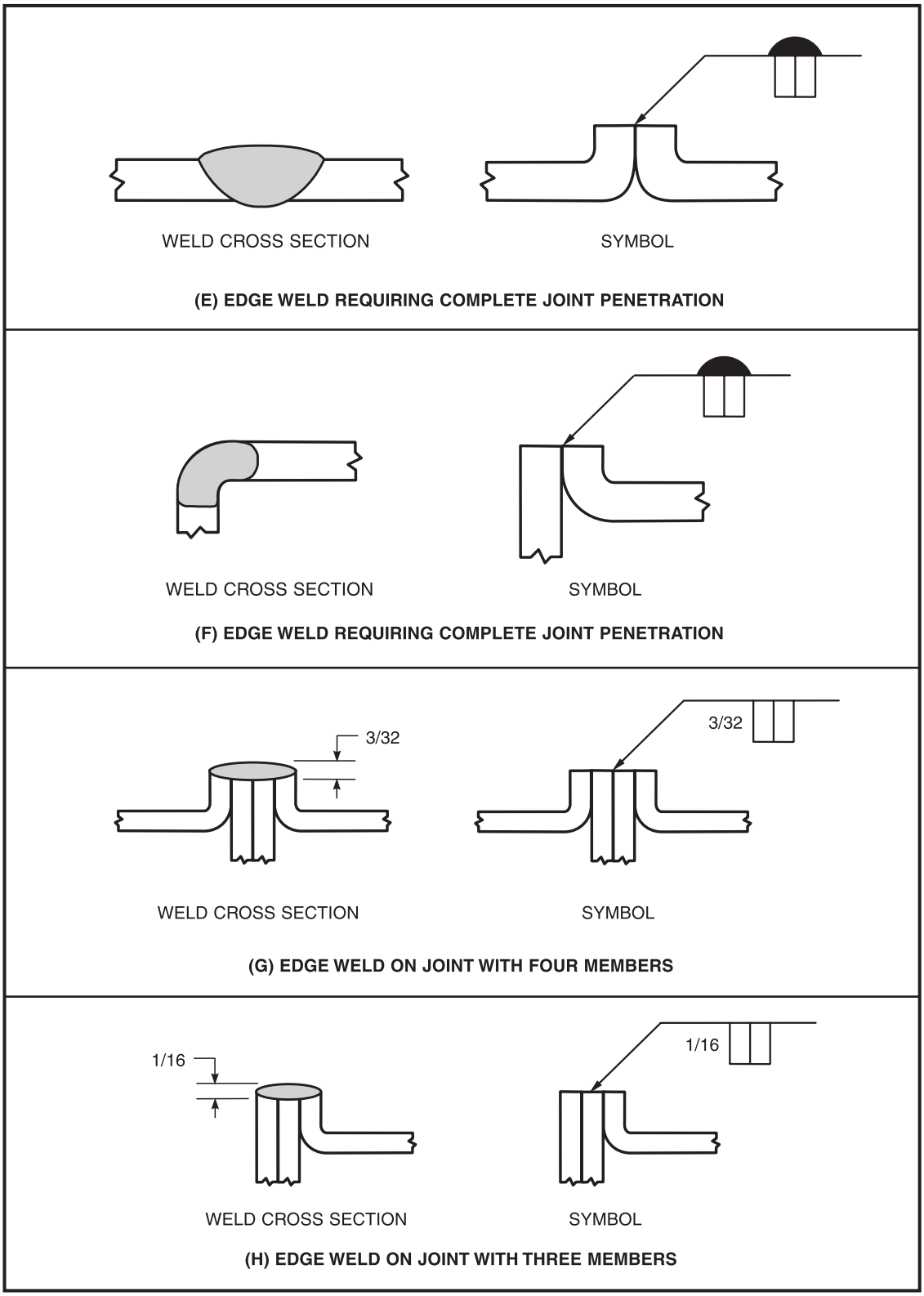


Figure 46 (Continued)—Application of the Edge Weld Symbol

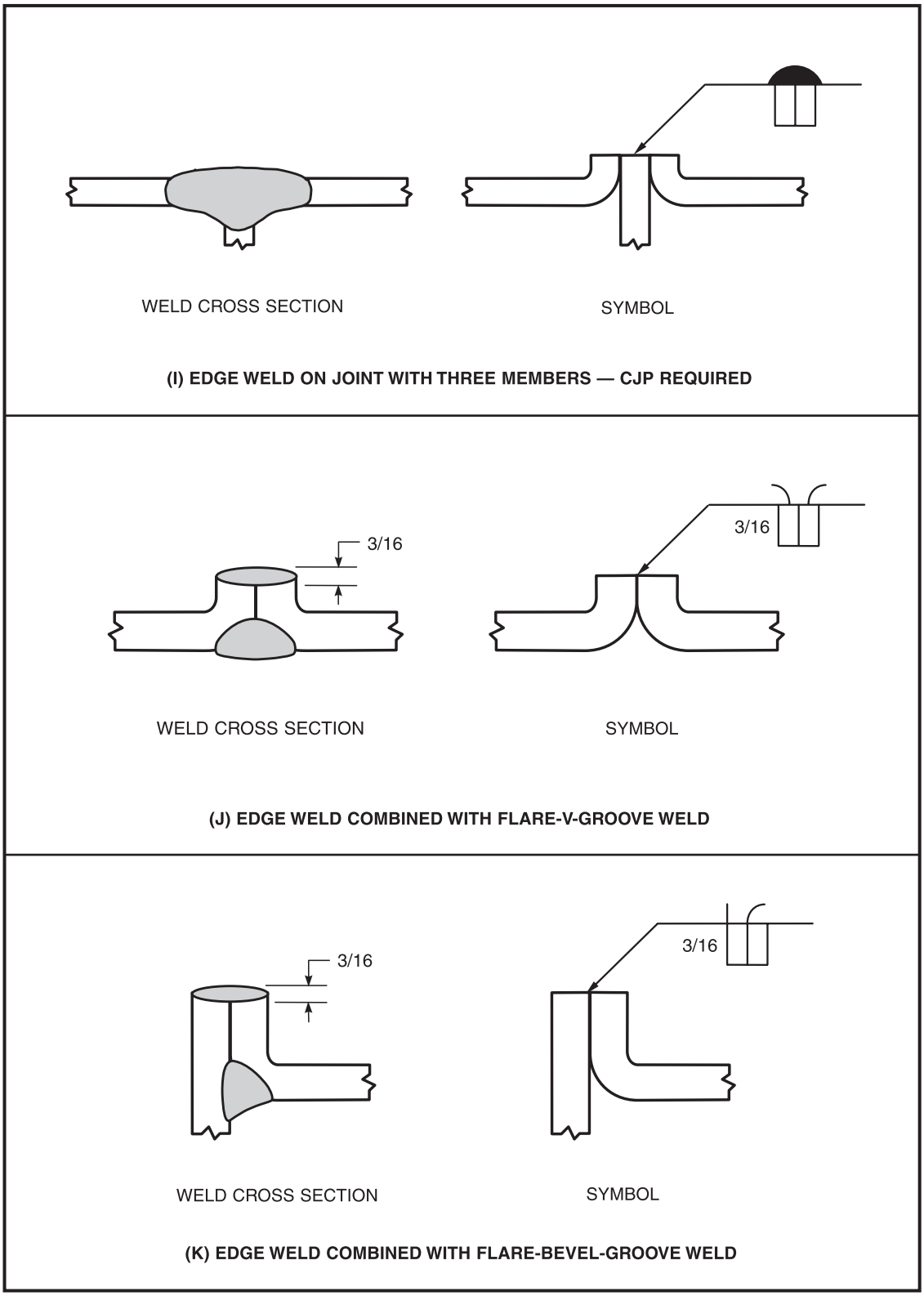
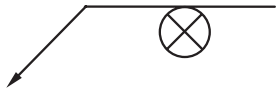


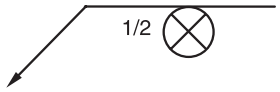
Figure 46 (Continued)—Application of the Edge Weld Symbol

13. Stud Welds

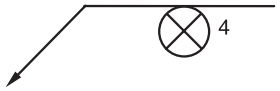
13.1 Side Significance. The stud weld symbol has arrow-side significance only. The symbol shall be placed below the reference line, and the arrow shall point clearly to the surface to which the stud is to be welded.



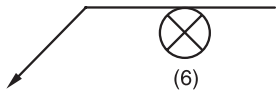
13.2 Stud Size. The required diameter of the stud shall be specified to the left of the weld symbol (see Figure 47).



13.3 Spacing of Stud Welds. The pitch (center-to-center distance) of stud welds in a straight line shall be specified to the right of the weld symbol (see Figure 47). The spacing of stud welds in any configuration other than a straight line shall be dimensioned on the drawing.



13.4 Number of Stud Welds. The number of stud welds shall be specified in parentheses below the stud weld symbol (see Figure 47).



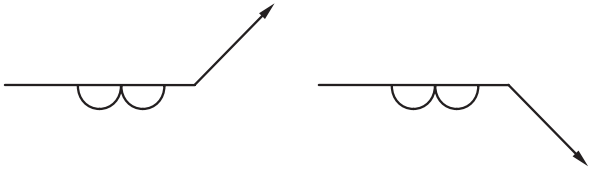
13.5 Dimension Location. Dimensions shall be placed on the same side of the reference line as the stud weld symbol (see Figure 47).

13.6 Location of First and Last Stud Welds. The location of the first and the last stud weld in each single line shall be specified on the drawing (see Figure 47).

14. Surfacing Welds

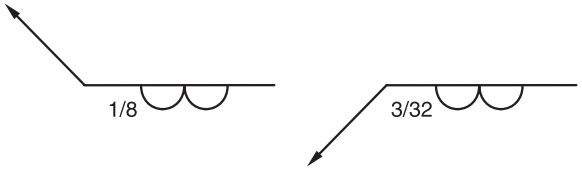
14.1 Use of the Surfacing Weld Symbol

14.1.1 Symbol Application. Surfacing, whether by single- or multiple-pass welds, shall be specified by the surfacing weld symbol (see Figure 48).



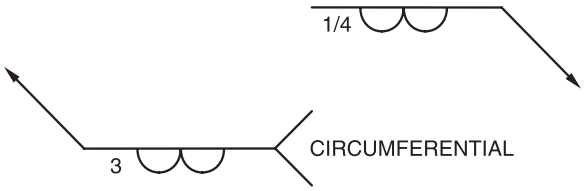
14.1.2 Arrow-Side Significance. The surfacing weld symbol does not indicate the welding of a joint and has arrow-side significance only. The symbol shall be placed below the reference line and the arrow shall point clearly to the surface on which the surfacing weld is to be deposited (see Figure 48).

14.1.3 Dimension Location. Dimensions used in conjunction with the surfacing weld symbol shall be placed on the same side of the reference line as the weld symbol [see Figure 48(A) and (C)].



14.2 Size (Thickness) of Surfacing Welds

14.2.1 Minimum Thickness. The size (thickness) of a surfacing weld shall be specified by placing the dimension of the required thickness to the left of the weld symbol [see Figure 48(A) and (C)]. The direction of welding may be specified by a note in the tail of the welding symbol or indicated on the drawing.



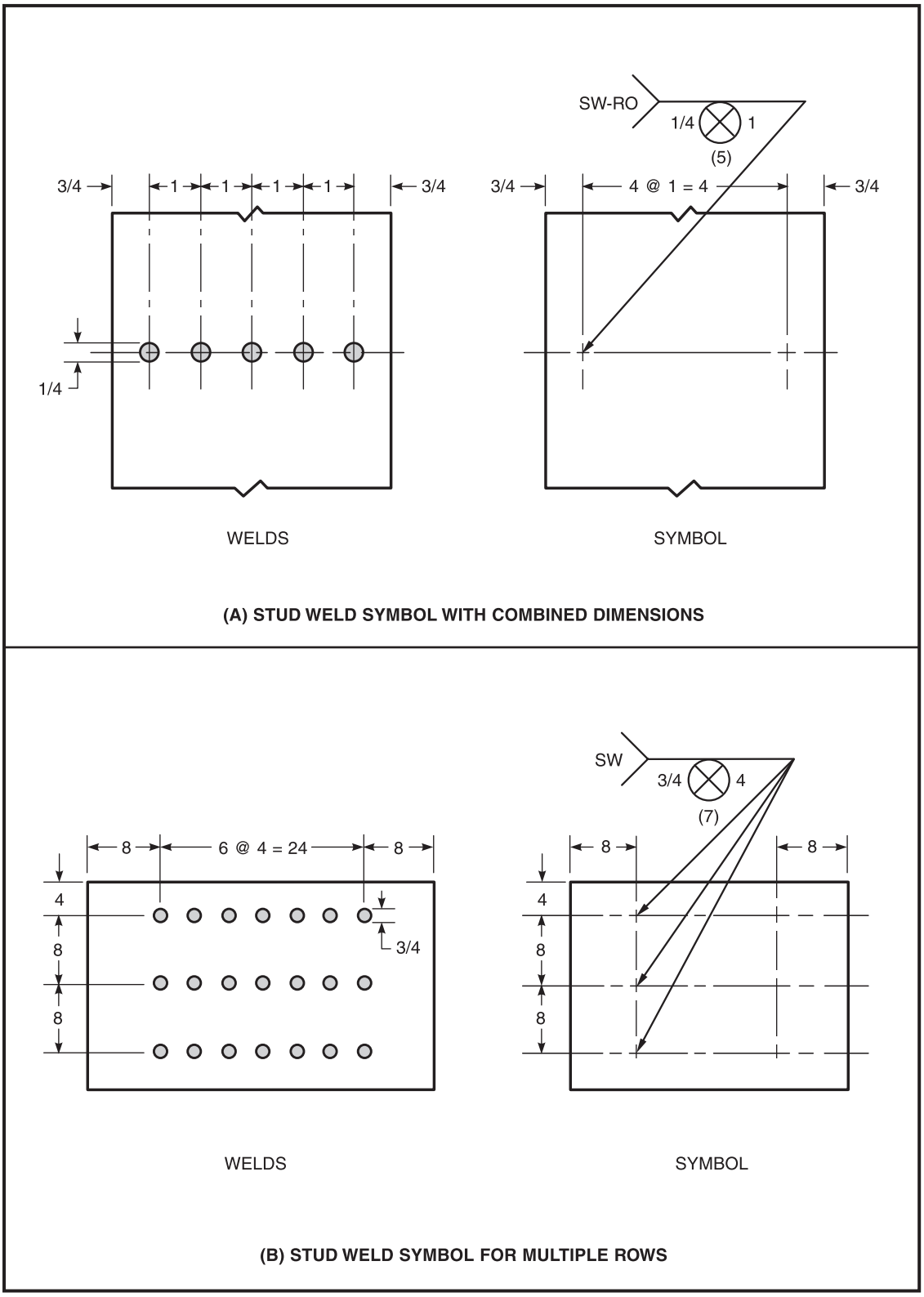


Figure 47—Application of the Stud Weld Symbol

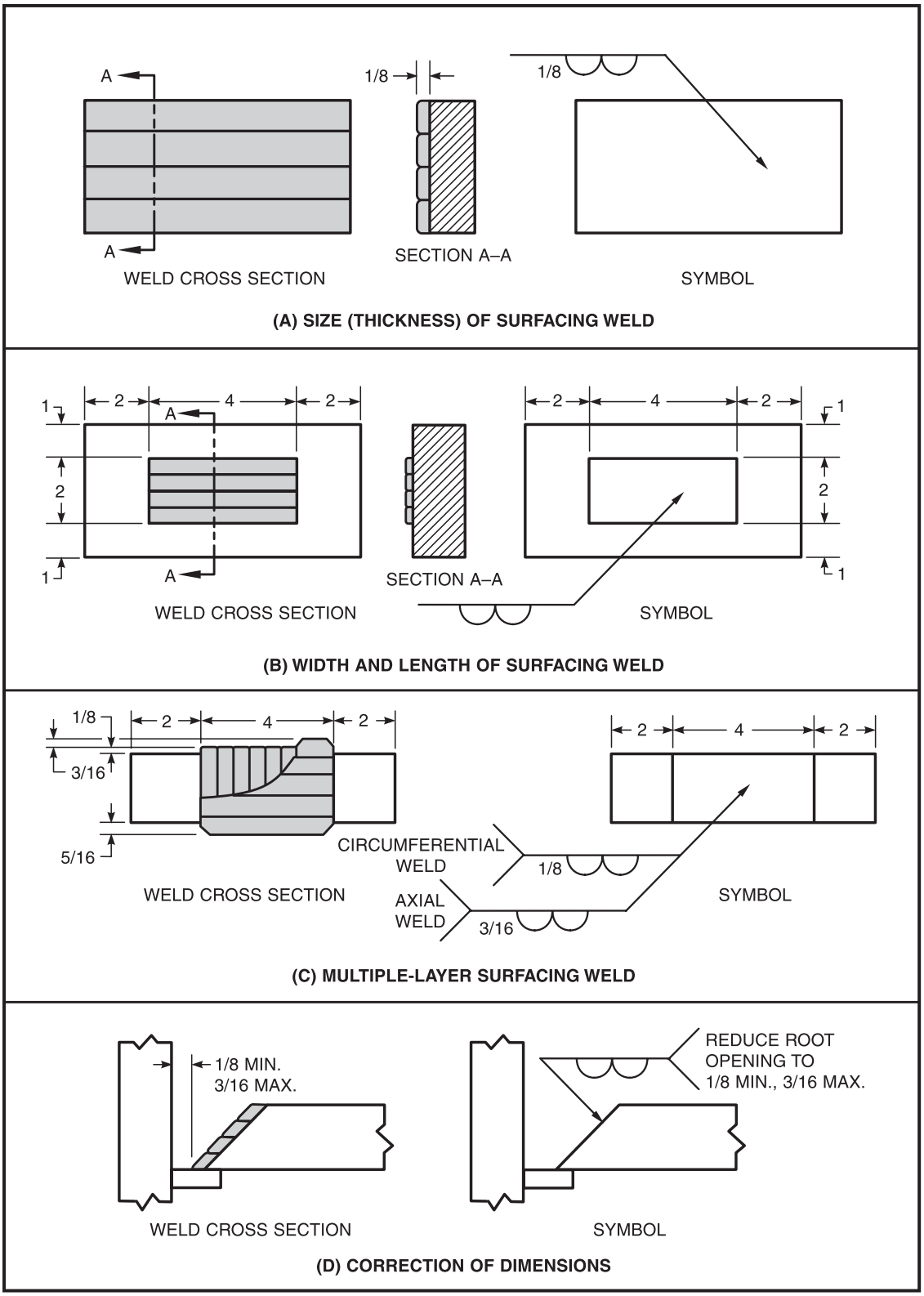
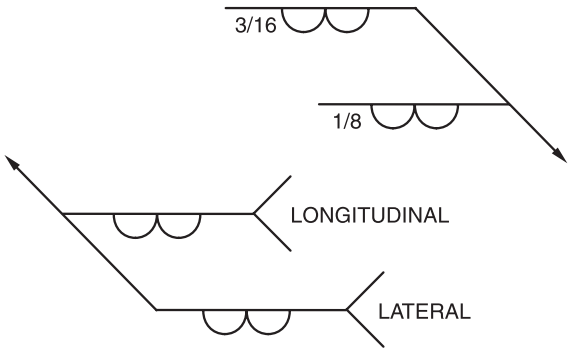


Figure 48—Application of the Surfacing Weld Symbol

14.2.2 Multiple Layer. Multiple-layer surfacing welds may be specified by using multiple reference lines with the required size (thickness) of each layer placed to the left of the weld symbols. The direction of welding may be specified by an appropriate note in the tail of the welding symbol or indicated on the drawing [see Figure 48(C)].



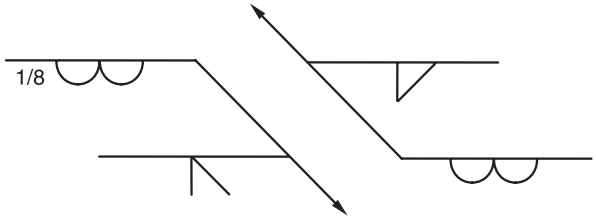
14.2.3 Unspecified Size (Thickness). When no specific thickness of a surfacing weld is required, the size dimension need not be included in the welding symbol [see Figure 48(B)].

14.3 Extent, Location, and Orientation of Surfacing Welds

14.3.1 Entire Area. No dimension other than size (thickness) is necessary to specify surfacing of the entire area of a plane or curved surface [see Figure 48(A)].

14.3.2 Portion of Area. When only a portion of a surface is to receive a surfacing weld, the extent, location, and orientation shall be shown on the drawing [see Figure 48(B) and (C)].

14.4 Surfacing a Previous Weld. Multiple reference lines may be used to specify a surfacing weld on the surface of a previously made weld (see 5.7).



14.5 Surfacing to Adjust Dimensions. The surfacing weld symbol may be used to specify a surfacing weld to correct assembly problems such as excessive root openings [see Figure 48(D)].

15. Brazing Symbols

15.1 General. All drawings of assemblies requiring brazing must have adequate brazing symbols designating the designer's requirements for the brazement. This will convey the designer's thoughts to the fabricating shop. When limited or no information is conveyed on a drawing by a brazing symbol, the fabricating shop can use their initiative when brazing, and this may result in the failure of the brazement in service.

15.2 Braze Fillet. It should be noted that the fillet weld symbol can be used only when the assembly is in the flat position and usually only when torch brazing. A fillet size is impossible to maintain, as gravity takes over when the joint is vertical or in any other position than perfectly flat and horizontal.

15.3 Special Preparation Not Specified. All symbols used for welding may also be used for brazing, where suitable. If no other special preparation other than cleaning is required, only the arrow and the reference line need be used, with the process indicated in the tail [see Figure 49(A), (B) and (C)].

15.4 Application of Symbols. The application of conventional weld symbols (as shown in Figure 1) to brazed joints is illustrated in Figure 49(D), (E), (G), (H), (I), and (J), which also depicts how joint clearance can be indicated.

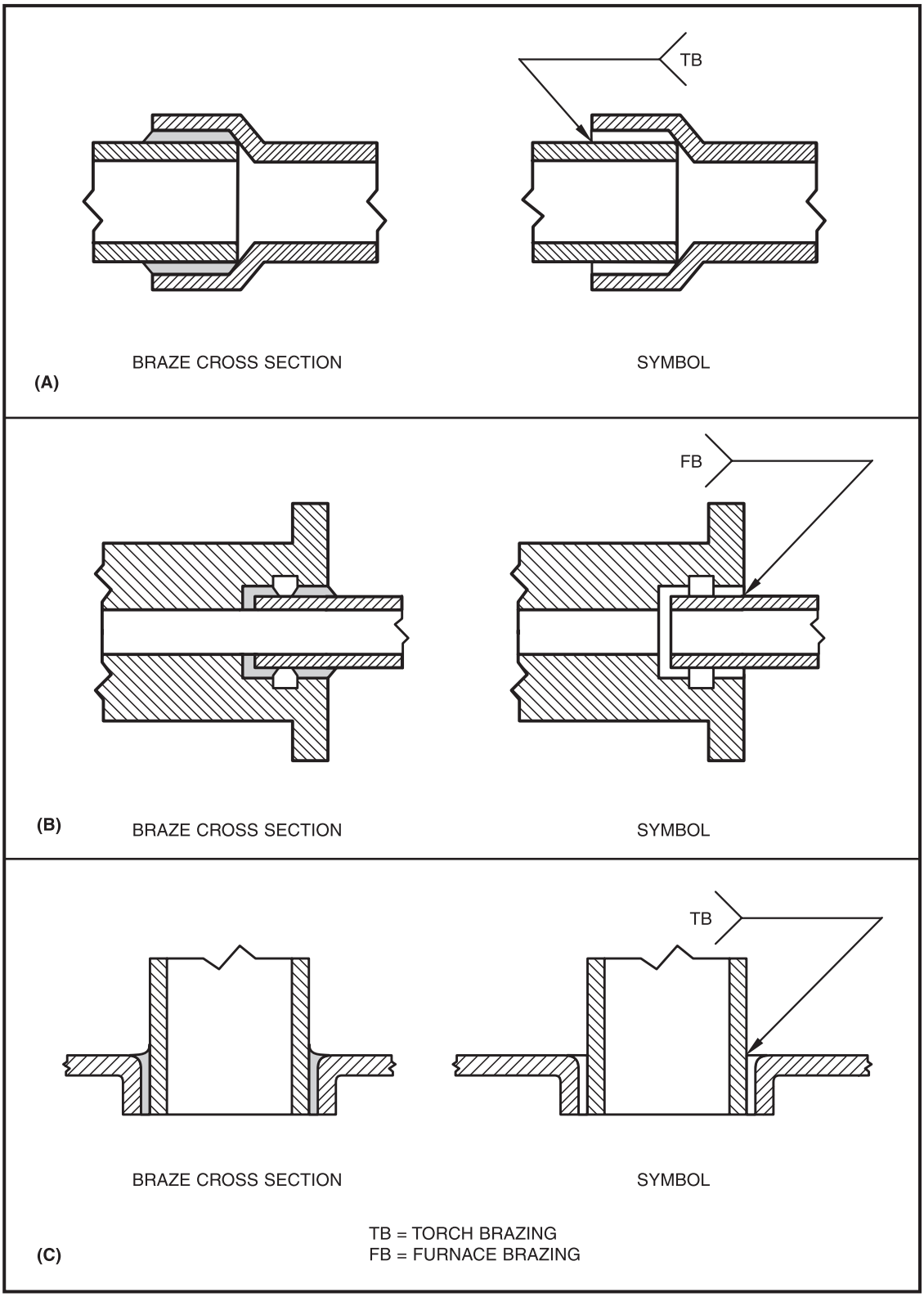
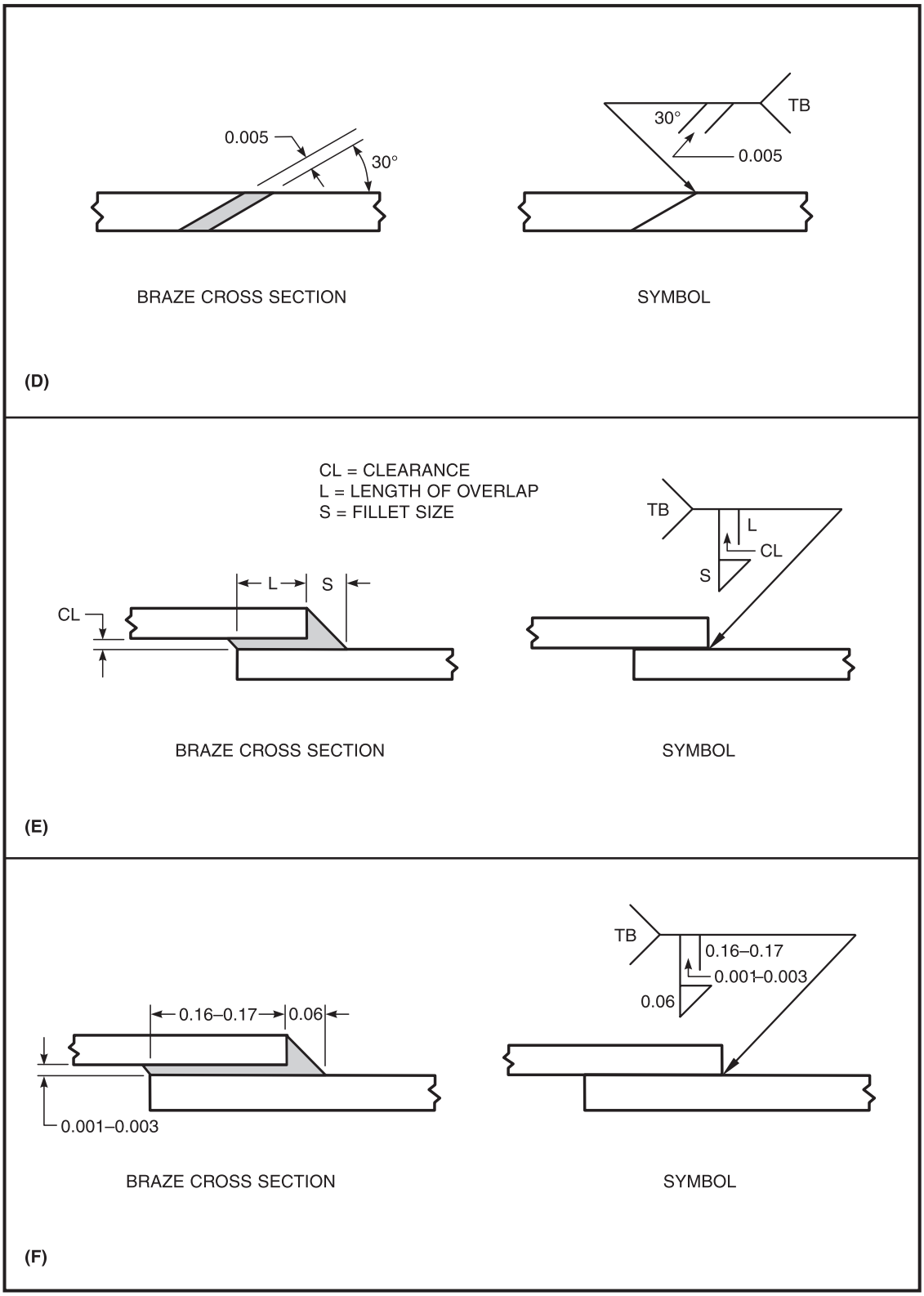
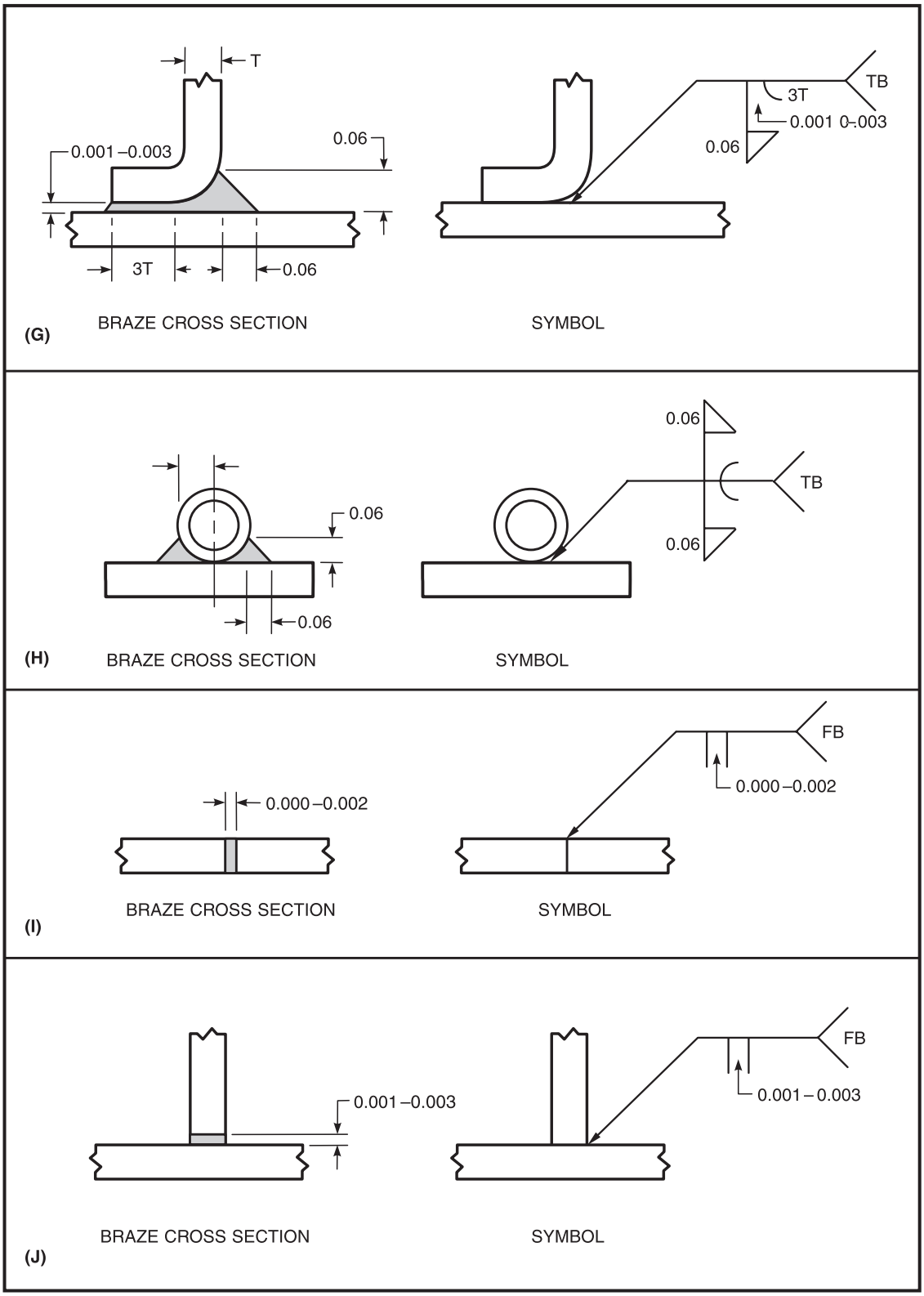


Figure 49—Application of Brazing Symbols



NOTE: The shaded area in the braze cross section denotes brazing filler metal.

Figure 49 (Continued)—Application of Brazing Symbols



NOTE: The shaded area in the braze cross section denotes brazing filler metal.

Figure 49 (Continued)—Application of Brazing Symbols

16. Nondestructive Examination Symbols

16.1 Elements. The nondestructive examination symbol consists of the following elements:

(1) Reference line,

(2) Arrow,

(3) Examination method letter designations,

(4) Extent and number of examinations,

(5) Supplementary symbols, and

(6) Tail (specifications, codes, or other references).

16.2 Examination Method Letter Designations. Nondestructive examination methods shall be specified by use of the letter designations shown in Annex A, Table A.6.

16.3 Supplementary Symbols. Supplementary symbols to be used in nondestructive examination symbols shall be as shown in Figure 50.

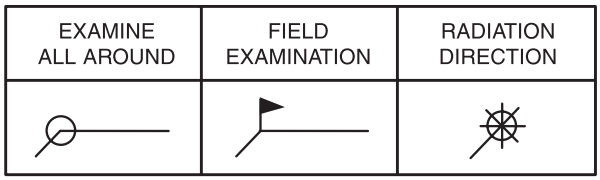


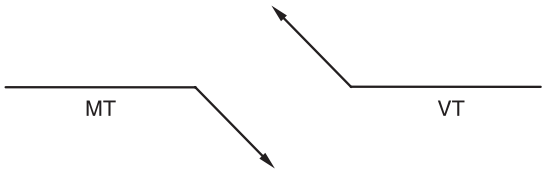
Figure 50—Supplementary Nondestructive Examination Symbols

16.4 Standard Location of the Elements. The elements of a nondestructive examination symbol shall have standard locations with respect to each other, as shown in Figure 51.

16.5 General Provisions for Nondestructive Examination Symbols

16.5.1 Location Significance of the Arrow. The arrow shall connect the reference line to the part to be examined. The side of the part to which the arrow points shall be considered the arrow side. The side opposite the arrow side of the part shall be considered the other side.

16.5.2 Location on the Arrow Side. Examinations to be made on the arrow side of the part shall be specified by placing the letter designation for the selected examination method below the reference line.



16.5.3 Location on the Other Side. Examinations to be made on the other side of the part shall be specified by placing the letter designation for the selected examination method above the reference line.

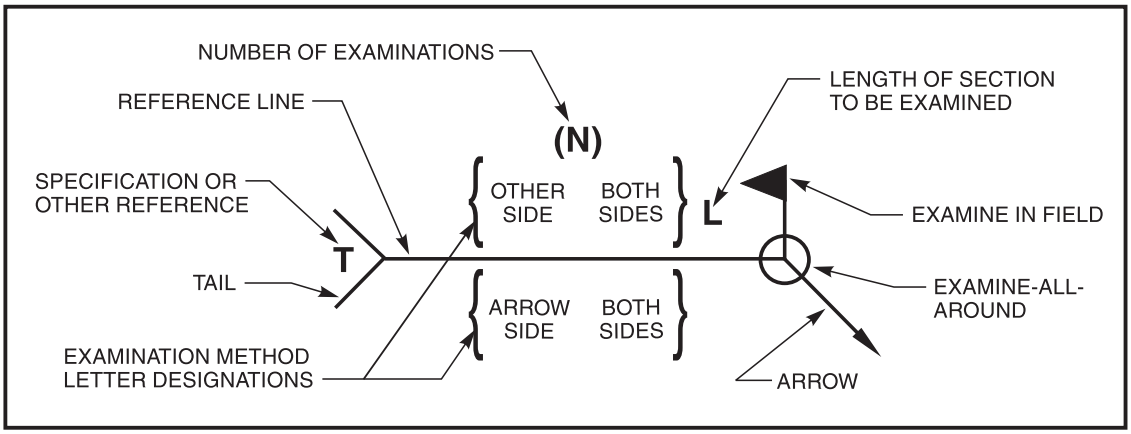
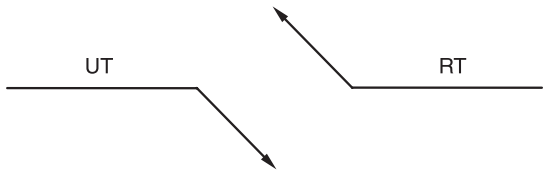
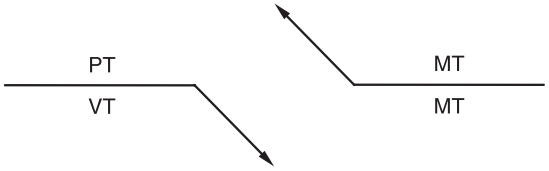


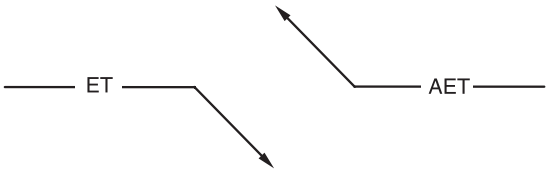
Figure 51—Standard Location of the Elements in the Nondestructive Examination Symbol



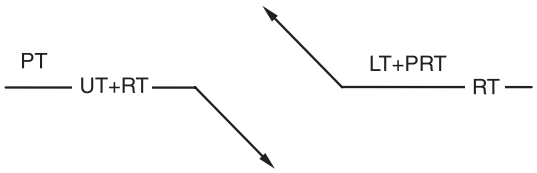
16.5.4 Location on Both Sides. Examinations to be made on both sides of the part shall be specified by placing the letter designation for the selected examination method on both sides of the reference line.



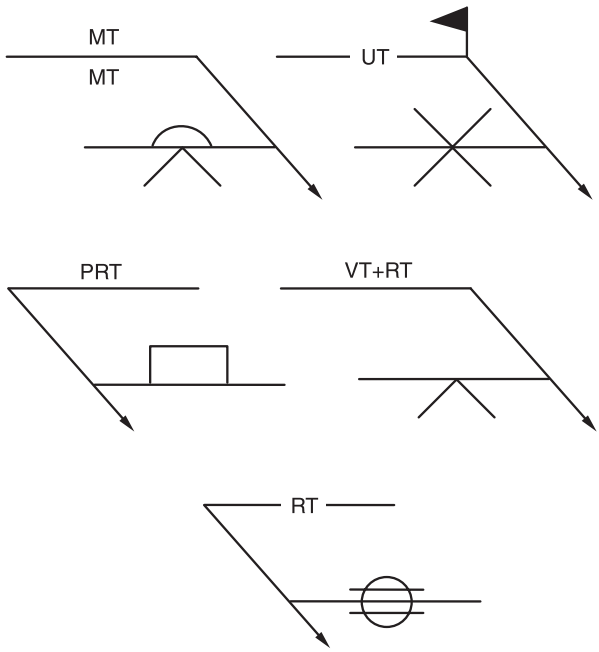
16.5.5 Location Centered on the Reference Line. When the letter designation has no arrow- or other-side significance, or there is no preference from which side the examination is to be made, the letter designation shall be centered on the reference line.



16.5.6 Examination Combinations. More than one examination method may be specified for the same part by placing the combined letter designations of the selected examination methods in the appropriate positions relative to the reference line. Letter designations for two or more examination methods, to be placed on the same side of the reference line or centered on the reference line, shall be separated by a plus sign.



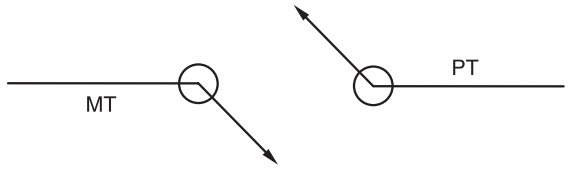
16.6 Welding and Nondestructive Examination Symbols. Nondestructive examination symbols and welding symbols may be combined.



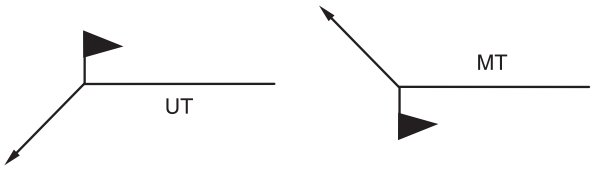
16.7 U.S. Customary and SI Units. When it is required to specify dimensions with nondestructive examination symbols, the same system of units that is standard for the drawing shall be used. Dual dimensioning shall not be used on nondestructive examination symbols. If it is required to include conversions from SI to U.S. Customary units or vice versa, a table of conversions may be included on the drawing. For guidance in drafting standards, refer to the ANSI Y14, *Drafting Manual Series.* For guidance on the use of SI units, refer to AWS A1.1, *Metric Practice Guide for the Welding Industry*.

16.8 Supplementary Nondestructive Examination Symbols

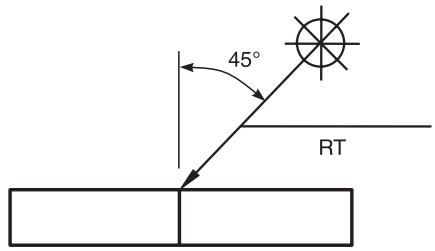
16.8.1 Examine-All-Around Symbol. Examinations required all around a weld, joint, or part shall be specified by placing the examine-all-around symbol at the junction of the arrow and reference lines.

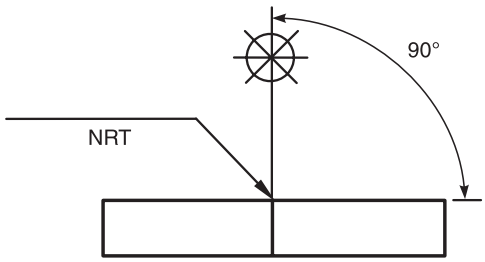


16.8.2 Field Examination Symbol. Examinations required to be conducted in the field (not in a shop or at the place of initial construction) shall be specified by placing the field examination symbol at the junction of the arrow and reference lines.

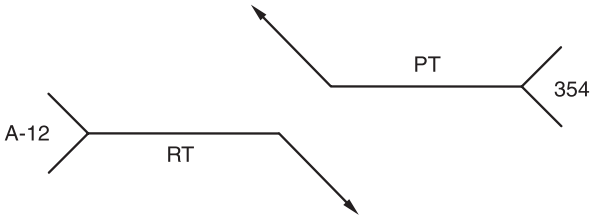


16.8.3 Radiation Direction Symbol. The direction of penetrating radiation may be specified by use of the radiation direction symbol drawn at the required angle on the drawing and the angle indicated, in degrees, to ensure no misunderstanding.



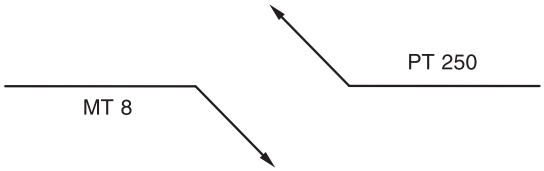


16.9 Specifications, Codes, and References. Information applicable to the examination specified and which is not otherwise provided may be placed in the tail of the nondestructive examination symbol.

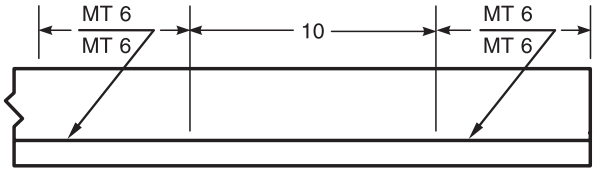


16.10 Extent, Location, and Orientation of Nondestructive Examination Symbols

16.10.1 Specifying the Length of the Section to be Examined. To specify the examination of welds or parts where only a portion of the length of a section need be considered, the length dimension shall be placed to the right of the letter designation.

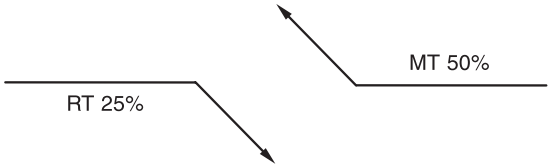


16.10.2 Location Shown. To specify the exact location of a section to be examined, as well as the length, dimension lines shall be used.

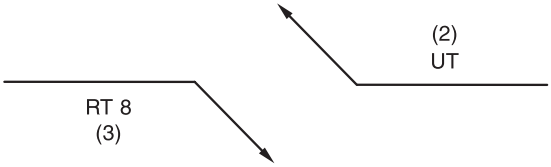


16.10.3 Full-Length Examination. When the full length of a part is to be examined, no length dimension need be included in the nondestructive examination symbol.

16.10.4 Partial Examination. When less than 100% of the length of a weld or part is to be examined, with locations to be determined by a specified procedure, the length to be examined is specified by placing the appropriate percentage to the right of the letter designation. The selected procedure may be specified by reference in the tail of the nondestructive examination symbol.

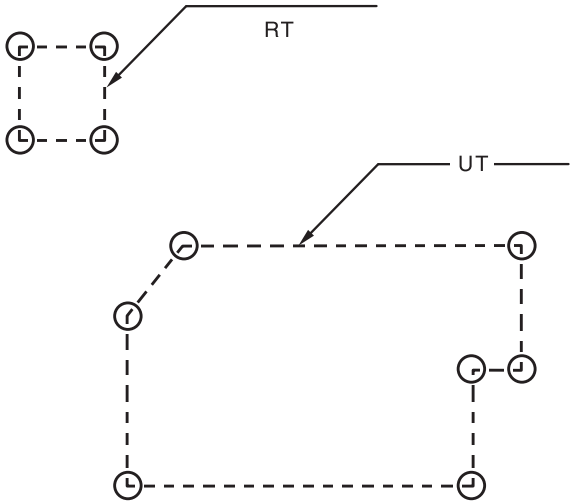


16.11 Number of Examinations. To specify a number of examinations to be conducted on a joint or part at random locations, the number of required examinations shall be placed in parentheses either above or below the letter designation away from the reference line.



16.12 Examination of Areas. The nondestructive examination of areas shall be specified by one of the following methods:

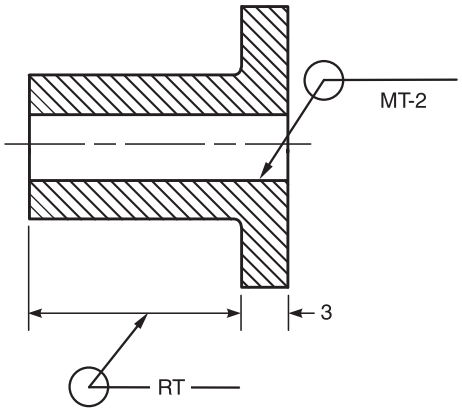
16.12.1 Plane Areas. To specify the nondestructive examination of an area represented as a plane on the drawing, the area to be examined shall be enclosed by straight, broken lines with a circle at each change in direction. The letter designations for the nondestructive examinations required shall be used in connection with these lines as shown below. When necessary, these enclosures shall be located by coordinate dimensions.



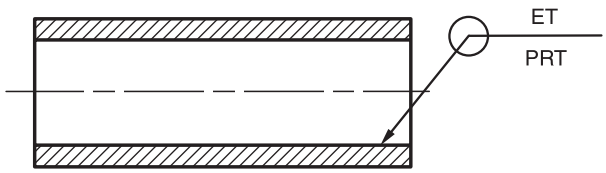
16.12.2 Areas of Revolution. For nondestructive examination of areas of revolution, the area shall be specified by using the examine-all-around symbol and the appropriate dimensions. The illustration presented below specifies the following:

(1) Magnetic particle examination of the bore of the flange for a distance of 2 in (51 mm) from the right-hand face, all the way around the circumference.

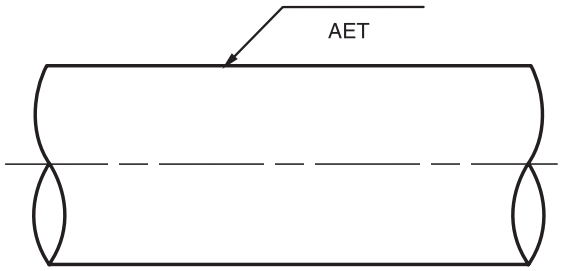
(2) Radiographic examination of an area of revolution where dimensions were not available on the drawing.



The symbol shown below specifies an area of revolution subject to an internal proof examination and an external eddy current examination. Since no dimensions are given, the entire length is to be examined.



16.12.3 Acoustic Emission. Acoustic emission examination (AET) is generally applied to all or a large portion of a component such as a pressure vessel or pipe. The symbol below indicates application of AET to the component without specific reference to location of sensors.



Annex A (Normative)

Tables

This annex is part of AWS A2.4 2007, *Standard Symbols for Welding Brazing, and Nondestructive Examination*, and includes mandatory elements for use with this standard.

Table A.1
Joint Type Designators

Designator	Joint Type
B	Butt
C	Corner
T	T-joint
L	Lap
E	Edge

Source: Adapted from AWS A3.0:2001, *Standard Welding Terms and Definitions*, Table 6, Miami: American Welding Society.

Table A.2
Letter Designations of Welding, Joining, and Allied Processes and Their Variations

Process	Letter Designation
adhesive bonding	AB
arc welding	AW
arc stud welding	SW
atomic hydrogen welding	AHW
bare metal arc welding	BMAW
carbon arc welding	CAW
gas carbon arc welding	CAW-G
shielded carbon arc welding	CAW-S
twin carbon arc welding	CAW-T
electrogas welding	EGW
flux cored arc welding	FCAW
gas shielded flux cored arc welding	FCAW-G
self shielded flux cored arc welding	FCAW-S
gas metal arc welding	GMAW
pulsed gas metal arc welding	GMAW-P
short circuit gas metal arc welding	GMAW-S
gas tungsten arc welding	GTAW
pulsed gas tungsten arc welding	GTAW-P
magnetically impelled arc welding	MIAW
plasma arc welding	PAW
shielded metal arc welding	SMAW
submerged arc welding	SAW
series submerged arc welding	SAW-S
brazing	B
block brazing	BB
diffusion brazing	DFB
dip brazing	DB
exothermic brazing	EXB
furnace brazing	FB
induction brazing	IB
infrared brazing	IRB
resistance brazing	RB
torch brazing	TB
twin carbon arc brazing	TCAB
braze welding	BW
arc braze welding	ABW
carbon arc braze welding	CABW
electron beam braze welding	EBBW
exothermic braze welding	EXBW
flow brazing	FLB
flow welding	FLOW
laser beam braze welding	LBBW
consumable guide electroslag welding	ESW-CG
electron beam welding	EBW
high vacuum electron beam welding	EBW-HV
medium vacuum electron beam welding	EBW-MV
nonvacuum electron beam welding	EBW-NV
electroslag welding	ESW
induction welding	IW
laser beam welding	LBW
oxyfuel gas welding	OFW
air acetylene welding	AAW
oxyacetylene welding	OAW
oxyhydrogen welding	OHW
pressure gas welding	PGW
percussion welding	PEW
resistance welding	RW
flash welding	FW
pressure-controlled resistance welding	RW-PC
projection welding	PW
resistance seam welding	RSEW
high-frequency seam welding	RSEW-HF
induction seam welding	RSEW-I
mash seam welding	RSEW-MS
resistance spot welding	RSW
upset welding	UW
high-frequency upset welding	UW-HF
induction upset welding	UW-I
soldering	S
dip soldering	DS
furnace soldering	FS
induction soldering	IS
infrared soldering	IRS
iron soldering	INS
resistance soldering	RS
torch soldering	TS
ultrasonic soldering	USS
wave soldering	WS
solid-state welding	SSW
coextrusion welding	CEW
cold welding	CW
diffusion welding	DFW
hot isostatic pressure welding	HIPW
explosion welding	EXW
forge welding	FOW
friction welding	FRW
direct drive friction welding	FRW-DD
friction stir welding	FSW
inertia friction welding	FRW-I
hot pressure welding	HPW
roll welding	ROW
ultrasonic welding	USW
thermal cutting	TC
arc cutting	AC
carbon arc cutting	CAC
air carbon arc cutting	CAC-A
gas metal arc cutting	GMAC
gas tungsten arc cutting	GTAC
plasma arc cutting	PAC
shielded metal arc cutting	SMAC
high energy beam cutting	HEBC
electron beam cutting	EBC
laser beam cutting	LBC
laser beam air cutting	LBC-A
laser beam evaporative cutting	LBC-EV
laser beam inert gas cutting	LBC-IG
laser beam oxygen cutting	LBC-O
oxygen cutting	OC
flux cutting	OC-F
metal powder cutting	OC-P
oxyfuel gas cutting	OFC
oxyacetylene cutting	OFC-A
oxyhydrogen gas cutting	OFC-H
oxynatural gas cutting	OFC-N
oxypropane cutting	OFC-P
oxygen arc cutting	OAC
oxygen gouging	OG
oxygen lance cutting	OLC

Table A.2 (Continued)
Letter Designations of Welding, Joining, and Allied Processes and Their Variations

Process	Letter Designation
thermal spraying	THSP
arc spraying	ASP
flame spraying	FLSP
wire flame spraying	FLSP-W
high velocity oxyfuel spraying	HVOF
plasma spraying	PSP
vacuum plasma spraying	VPSP
thermite welding	TW

Source: Reproduced from AWS A3.0:2001, *Standard Welding Terms and Definitions*, Table 1, Miami: American Welding Society.

Table A.3
Alphabetical Cross-Reference to Table A.2 by Process

Process	Letter Designation
adhesive bonding	AB
air acetylene welding	AAW
air carbon arc cutting	CAC-A
arc braze welding	ABW
arc cutting	AC
arc spraying	ASP
arc stud welding	SW
arc welding	AW
atomic hydrogen welding	AHW
bare metal arc welding	BMAW
block brazing	BB
braze welding	BW
brazing	B
carbon arc braze welding	CABW
carbon arc cutting	CAC
carbon arc welding	CAW
coextrusion welding	CEW
cold welding	CW
consumable guide electroslag welding	ESW-CG
diffusion brazing	DFB
diffusion welding	DFW
dip brazing	DB
dip soldering	DS
direct drive friction welding	FRW-DD
electrogas welding	EGW
electron beam braze welding	EBBW
electron beam cutting	EBC
electron beam welding	EBW
electroslag welding	ESW
exothermic braze welding	EXBW
exothermic brazing	EXB
explosion welding	EXW
flame spraying	FLSP
flash welding	FW
flow brazing	FLB
flow welding	FLOW
flux cored arc welding	FCAW
flux cutting	OC-F
forge welding	FOW
friction stir welding	FSW
friction welding	FRW
furnace brazing	FB
furnace soldering	FS
gas carbon arc welding	CAW-G
gas metal arc cutting	GMAC
gas metal arc welding	GMAW
gas shielded flux cored arc welding	FCAW-G
gas tungsten arc cutting	GTAC
gas tungsten arc welding	GTAW
high energy beam cutting	HEBC
high vacuum electron beam welding	EBW-HV
high velocity oxyfuel spraying	HVOF
high-frequency seam welding	RSEW-HF
high-frequency upset welding	UW-HF
hot isostatic pressure welding	HIPW
hot pressure welding	HPW
induction brazing	IB
induction seam welding	RSEW-I
induction soldering	IS
induction upset welding	UW-I
induction welding	IW
inertia friction welding	FRW-I
infrared brazing	IRB
infrared soldering	IRS
iron soldering	INS
laser beam air cutting	LBC-A
laser beam braze welding	LBBW
laser beam cutting	LBC
laser beam evaporative cutting	LBC-EV
laser beam inert gas cutting	LBC-IG
laser beam oxygen cutting	LBC-O
laser beam welding	LBW
magnetically impelled arc welding	MIAW
mash seam welding	RSEW-MS
medium vacuum electron beam welding	EBW-MV
metal powder cutting	OC-P
nonvacuum electron beam welding	EBW-NV
oxyacetylene cutting	OFC-A
oxyacetylene welding	OAW
oxyfuel gas cutting	OFC
oxyfuel gas welding	OFW
oxygen arc cutting	OAC
oxygen cutting	OC
oxygen gouging	OG
oxygen lance cutting	OLC
oxyhydrogen gas cutting	OFC-H

Table A.3 (Continued)
Alphabetical Cross-Reference to Table A.2 by Process

Process	Letter Designation
oxyhydrogen welding	OHW
oxynatural gas cutting	OFC-N
oxypropane cutting	OFC-P
percussion welding	PEW
plasma arc cutting	PAC
plasma arc welding	PAW
plasma spraying	PSP
pressure gas welding	PGW
pressure-controlled resistance welding	RW-PC
projection welding	PW
pulsed gas metal arc welding	GMAW-P
pulsed gas tungsten arc welding	GTAW-P
resistance brazing	RB
resistance seam welding	RSEW
resistance soldering	RS
resistance spot welding	RSW
resistance welding	RW
roll welding	ROW
self shielded flux cored arc welding	FCAW-S
series submerged arc welding	SAW-S
shielded carbon arc welding	CAW-S
shielded metal arc cutting	SMAC
shielded metal arc welding	SMAW
short circuit gas metal arc welding	GMAW-S
soldering	S
solid-state welding	SSW
submerged arc welding	SAW
thermal cutting	TC
thermal spraying	THSP
thermite welding	TW
torch brazing	TB
torch soldering	TS
twin carbon arc brazing	TCAB
twin carbon arc welding	CAW-T
ultrasonic soldering	USS
ultrasonic welding	USW
upset welding	UW
vacuum plasma spraying	VPSP
wave soldering	WS
wire flame spraying	FLSP-W

Source: Reproduced from AWS A3.0:2001, *Standard Welding Terms and Definitions*, Table 2, Miami: American Welding Society.

Table A.4
Alphabetical Cross-Reference to Table A.2 by Letter Designation

Letter Designation	Process
AAW	air acetylene welding
AB	adhesive bonding
ABW	arc braze welding
AC	arc cutting
AHW	atomic hydrogen welding
AAW	air acetylene welding
AB	adhesive bonding
ABW	arc braze welding
ASP	arc spraying
AW	arc welding
B	brazing
BB	block brazing
BMAW	bare metal arc welding
BW	braze welding
CABW	carbon arc braze welding
CAC	carbon arc cutting
CAC-A	air carbon arc cutting
CAW	carbon arc welding
CAW-G	gas carbon arc welding
CAW-S	shielded carbon arc welding
CAW-T	twin carbon arc welding
CEW	coextrusion welding
CW	cold welding
DB	dip brazing
DFB	diffusion brazing
DFW	diffusion welding
DS	dip soldering
EBBW	electron beam braze welding
EBC	electron beam cutting
EBW	electron beam welding
EBW-HV	high vacuum electron beam welding
EBW-MV	medium vacuum electron beam welding
EBW-NV	nonvacuum electron beam welding
EGW	electrogas welding
ESW	electroslag welding
ESW-CG	consumable guide electroslag 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
FLB	flow brazing
FLOW	flow welding
FLSP	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

Table A.4 (Continued)
Alphabetical Cross-Reference to Table A.2 by Letter Designation

Process	Letter Designation
GMAC	gas metal arc cutting
GMAW	gas metal arc welding
GMAW-P	pulsed gas metal arc welding
GMAW-S	short circuit 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
HIPW	hot isostatic pressure welding
HPW	hot pressure welding
HVOF	high velocity oxyfuel spraying
IB	induction brazing
INS	iron soldering
IRB	infrared brazing
IRS	infrared soldering
IS	induction soldering
IW	induction welding
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
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
PAW	plasma arc welding
PEW	percussion welding
PGW	pressure gas welding
PSP	plasma spraying
PW	projection welding
RB	resistance brazing
ROW	roll welding
RS	resistance soldering
RSEW	resistance seam welding
RSEW-HF	high-frequency seam welding
RSEW-I	induction seam welding
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
SSW	solid-state welding
SW	arc stud welding
TB	torch brazing
TC	thermal cutting
TCAB	twin carbon arc brazing
THSP	thermal spraying
TS	torch soldering
VPSP	vacuum plasma spraying
TW	thermite welding
USS	ultrasonic soldering
USW	ultrasonic welding
UW	upset welding
UW-HF	high-frequency upset welding
UW-I	induction upset welding
WS	wave soldering

Source: Reproduced from AWS A3.0:2001, *Standard Welding Terms and Definitions*, Table 3, Miami: American Welding Society.

Table A.5
Suffixes for Optional Use in Applying Welding, Brazing, and Allied Processes

Process	Letter Designation
Adaptive control	AD
Automatic	AU
Manual	MA
Mechanized	ME
Robotic	RO
Semiautomatic	SA

Source: Reproduced from AWS A3.0:2001, *Standard Welding Terms and Definitions*, Table 4, Miami: American Welding Society.

Table A.6
Examination Method Letter Designations

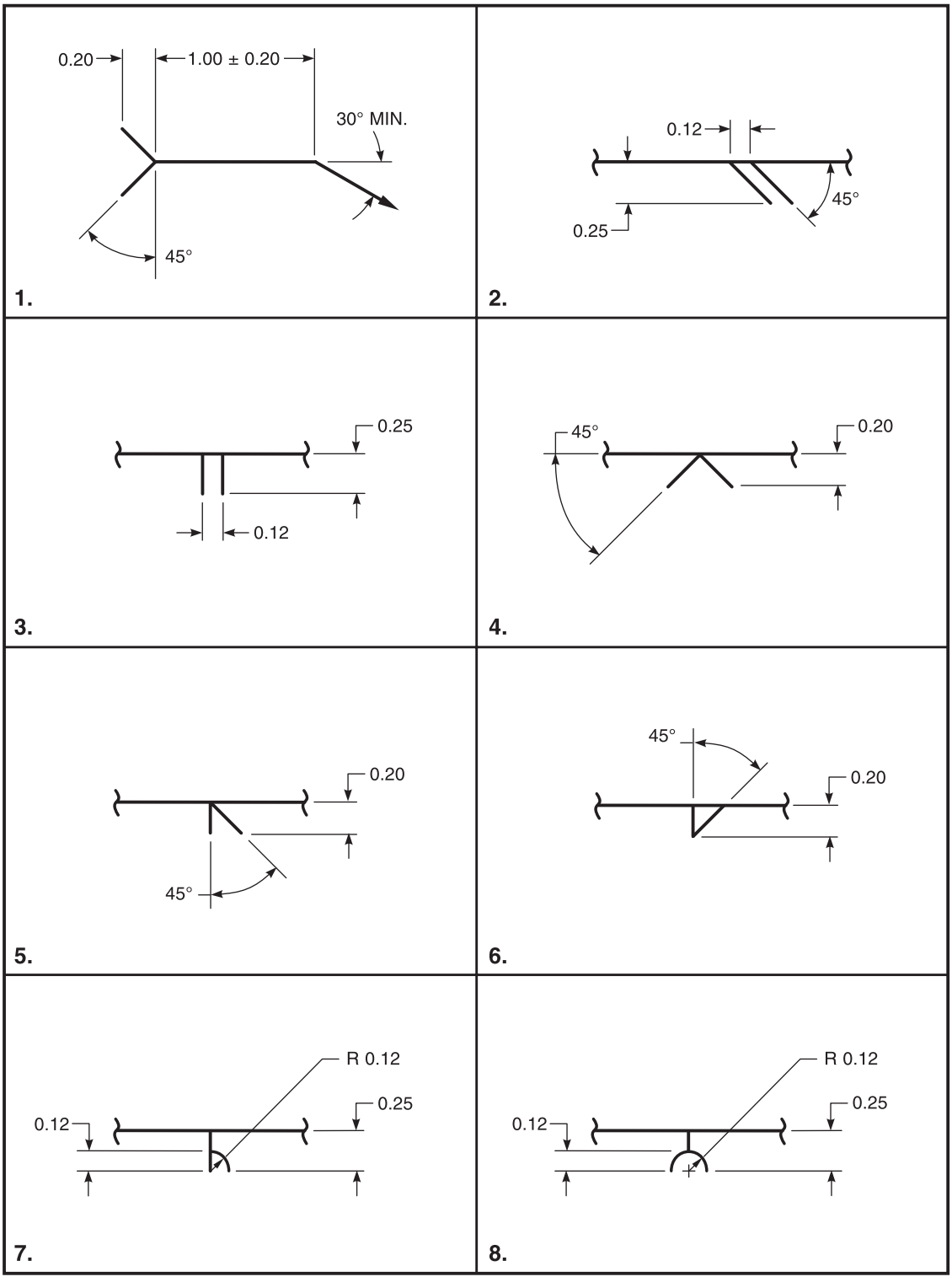
Examination Method	Letter Designation
Acoustic emission	AET
Electromagnetic	ET
Leak	LT
Magnetic particle	MP
Neutron radiographic	NRT
Penetrant	PT
Proof	PRT
Radiographic	RT
Ultrasonic	UT
Visual	VT

Annex B (Informative)

Design of Standard Symbols (U.S. Customary Units)

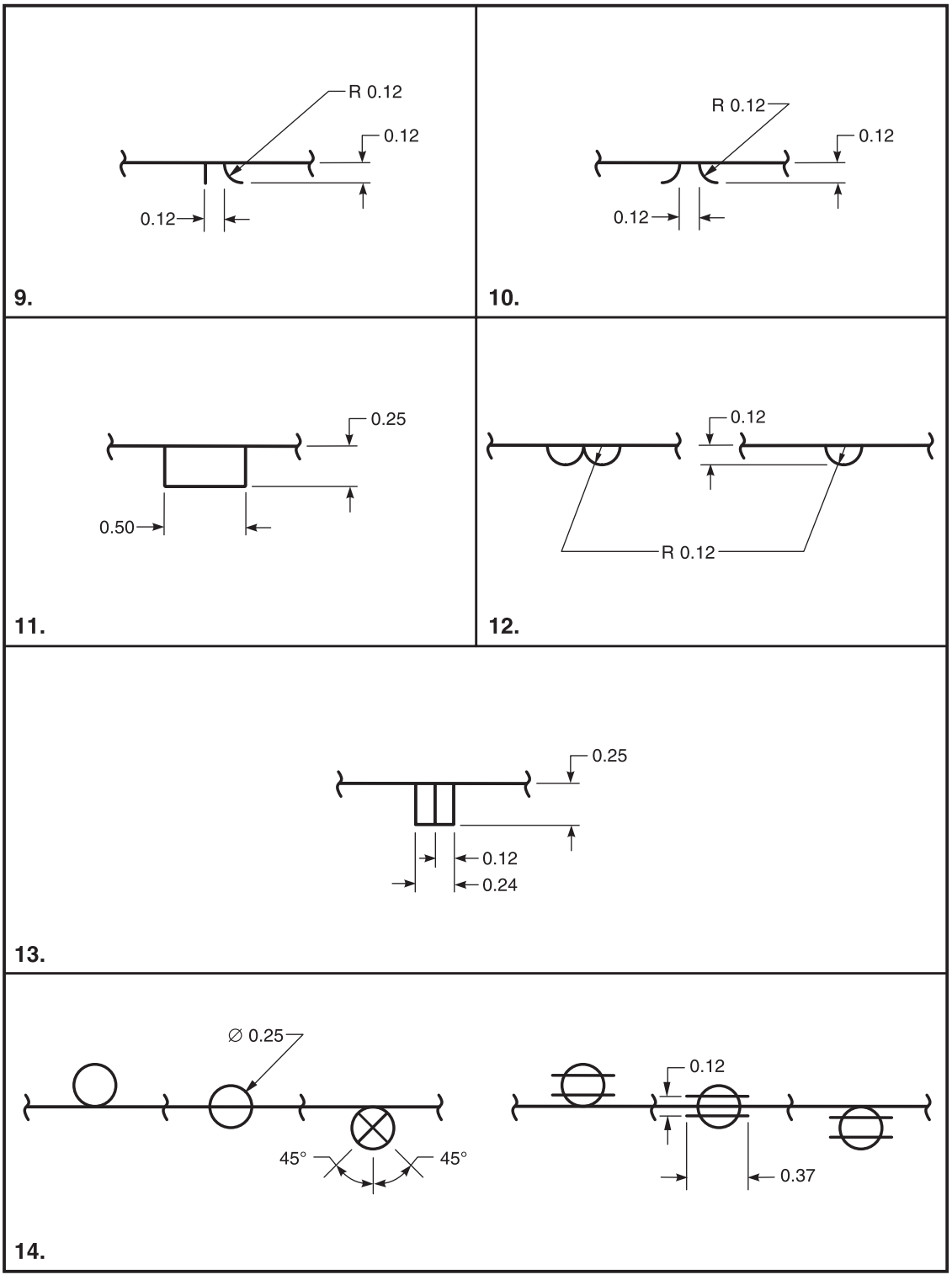
This annex is not part of AWS A2.4:2007, *Specification for Standard Symbols for Welding, Brazing, and Nondestructive Examination*, but is included for informational purposes only.

Annex B (Continued)
Design of Standard Symbols (U.S. Customary Units)



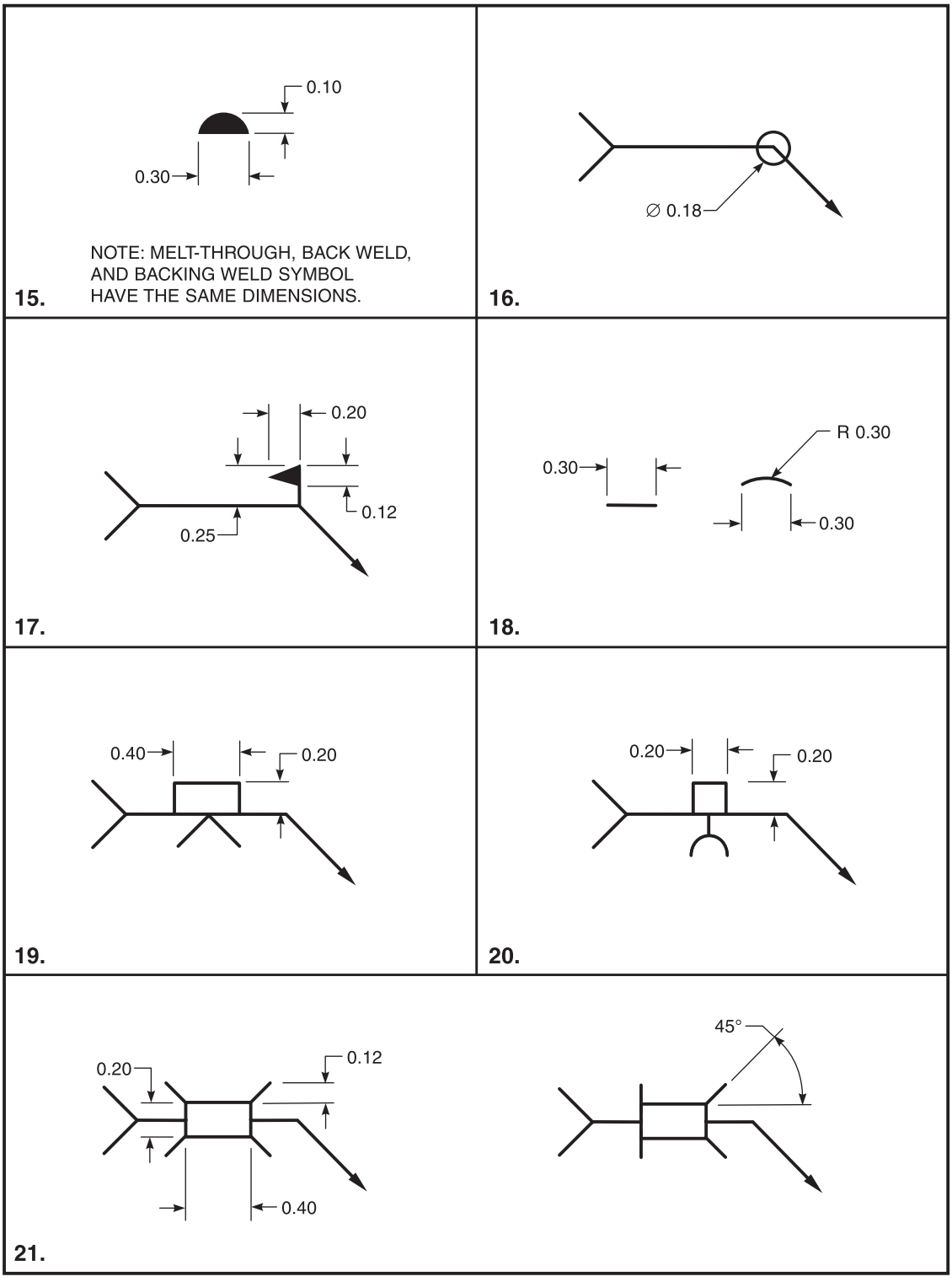
NOTES:
1. Unless otherwise specified, tolerances shall be ±0.04 in or ±1°, as applicable.
2. All radii are minimum dimensions.

Annex B (Continued)
Design of Standard Symbols (U.S. Customary Units)



NOTES:
1. Unless otherwise specified, tolerances shall be ±0.04 in or ±1°, as applicable.
2. All radii are minimum dimensions.

Annex B (Continued)
Design of Standard Symbols (U.S. Customary Units)



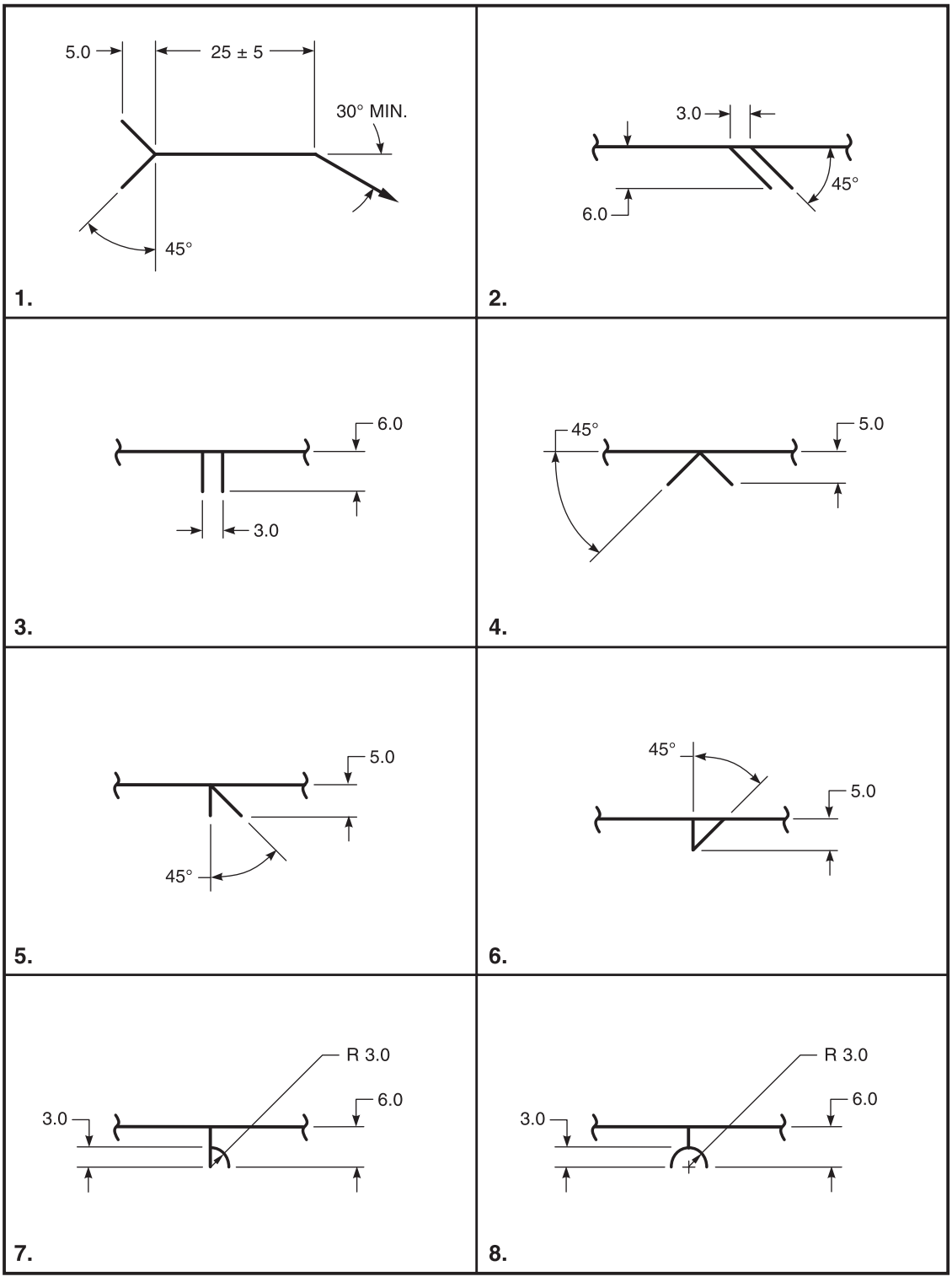
NOTES:
1. Unless otherwise specified, tolerances shall be ±0.04 in or ±1°, as applicable.
2. All radii are minimum dimensions.

Annex C (Informative)

Design of Standard Symbols (SI Units)

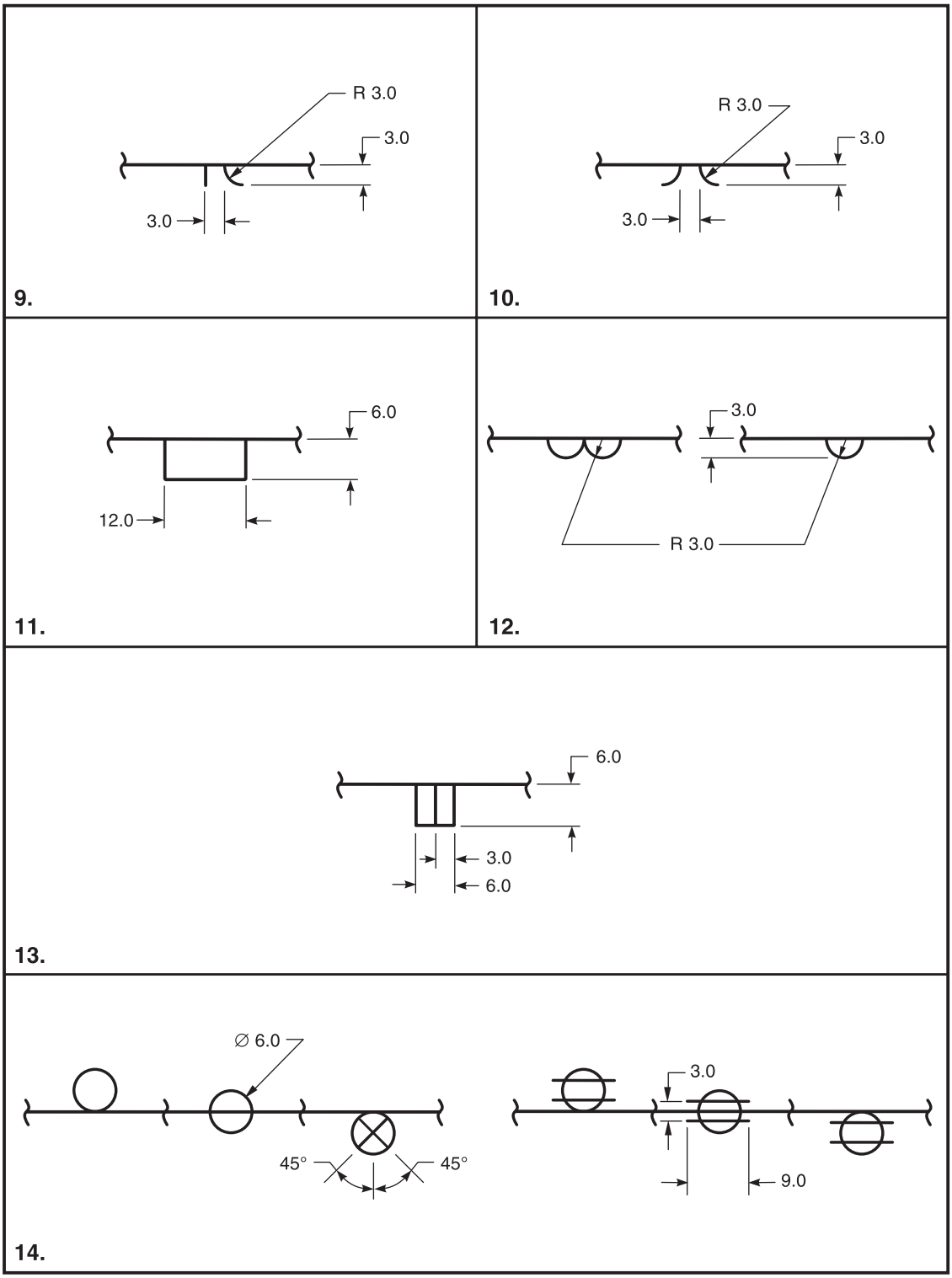
This annex is not part of AWS A2.4:2007, *Specification for Standard Symbols for Welding, Brazing, and Nondestructive Examination*, but is included for informational purposes only.

Annex C (Continued)
Design of Standard Symbols (SI Units)



NOTES:
1. Unless otherwise specified, tolerances shall be ±1 mm or ±1°, as applicable.
2. All radii are minimum dimensions.

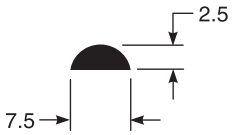
Annex C (Continued)
Design of Standard Symbols (SI Units)



NOTES:
1. Unless otherwise specified, tolerances shall be ±1 mm or ±1°, as applicable.
2. All radii are minimum dimensions.

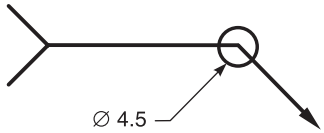
Annex C (Continued)
Design of Standard Symbols (SI Units)

15.

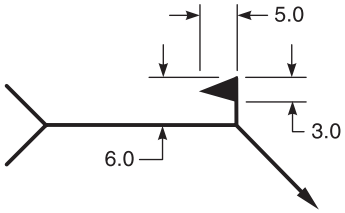


NOTE: MELT-THROUGH, BACK WELD, AND BACKING WELD SYMBOL HAVE THE SAME DIMENSIONS.

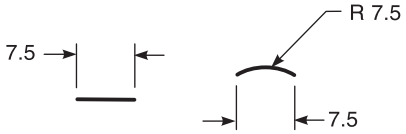
16.



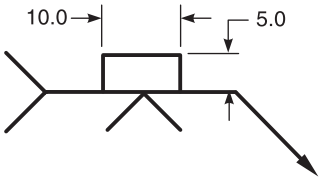
17.



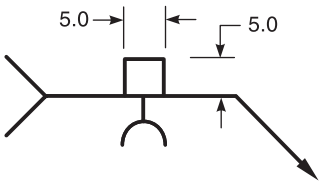
18.



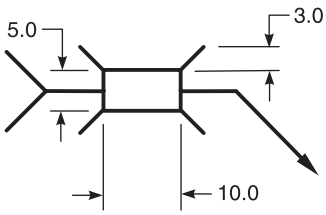
19.

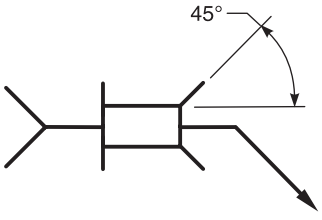


20.



21.





NOTES:
1. Unless otherwise specified, tolerances shall be ±1 mm or ±1°, as applicable.
2. All radii are minimum dimensions.

Annex D (Informative)

Commentary on AWS A2.4, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*

This annex is not part of AWS A2.4:2007, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*, but is included for informational purposes only.

NOTE: Numbered subclauses in this annex relate to similarly numbered subclauses in the text of AWS A2.4, e.g., subclause D5.8 is a commentary on subclause 5.8 in the text.

D5.8 Field Weld Symbols. Welds are designated to be made in the field by the addition of the field weld symbol when the welding symbols are added to a drawing. It should be understood, however, that the placing of field weld symbols on drawings at the design stage does not preclude further discussion by the parties involved nor different decisions regarding where the welding will be done. If changes are made, the drawings should be revised and the field weld symbols should be added or deleted, as appropriate.

D5.9.2 Square and Rectangular Tubing. The use of square and rectangular tubing has resulted in numerous applications involving joints in which the axes of the tubes are perpendicular as a branch-to-header or a T-connection. The tubes are often of equal size, as illustrated below. It is intended that welds extend around the outside surface of the branch tube or stem of the T. The welds are usually fillet or square-groove on two of the opposite sides and flare-bevel-groove on the other two opposite sides.

The weld-all-around symbol is not appropriate to specify the welds described since the joints are not all of the same type and the welds may differ in size. Instead, two welding symbols should be used, each with two arrows pointing to the specific joints intended, one to specify the fillet or square-groove welds and the second to specify the flare-bevel-groove welds, as shown in Figure D.1.

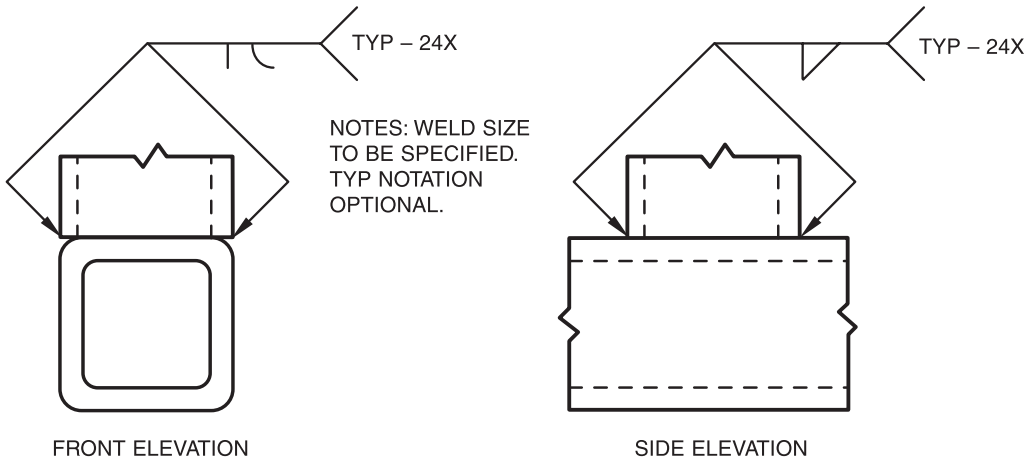


Figure D.1—Examples of the Welding of Tubing

D5.10.1 Weld-All-Around Symbol. A continuous weld is one that has no breaks in its length and does not change in size, geometry, or weld type. Such a weld, which extends around a series of connected joints and ends at the point of origin, may be specified by adding the weld-all-around symbol. The joint may require welding in different directions and positions, and the welds may lie in more than one plane. The most common applications involve either fillet welds or square-groove welds and are often intended to provide a gas or liquid seal in addition to or in lieu of carrying the loads imposed on the joints. The weld-all-around symbol should not be used in place of the double-fillet or symmetrical double-groove weld symbols for specifying welds on both sides of the same thickness of base metal.

D5.11.3 Welding Symbols Designated "TYPICAL." The "TYPICAL" designation is intended as an alternative to repeating identical welding symbols many times on the same drawing, but only when the joints represented are identical in all details. The "TYPICAL" notation, usually abbreviated "TYP," is added to the tail of the welding symbol, and all applicable joints must be completely identified, e.g., "TYP at four stiffeners."

Misuse of the "TYPICAL" designation has caused many instances of confusion and fabrication errors by failing to completely identify all applicable joints or by identifying joints that might be similar but not identical. If more extensive information is required, it may be stated in a separate drawing note with a reference in the tail of the welding symbol.

D5.18 Changes in Joint Geometry during Welding. Joint geometry of groove welds is sometimes changed as a result of specified welding operations. These changes in joint geometry are not to be included in the welding symbol. For example, a welding symbol could specify a V-groove weld on the arrow side of a joint and a square-groove weld on the other side of the joint with backgouging to sound metal, from the other side of the joint, using air carbon arc cutting. With the V-groove weld completed, the backgouging operation would be expected to produce a weld groove that could be described as a U-groove. This change in geometry, from a square-groove to a U-groove, is not to be specified in the welding symbol (see Figure D.2).

D6.2.2 Complete Joint Penetration. Complete joint penetration is defined as penetration of weld metal through the thickness of a joint with a groove weld. The simplest way of specifying such a groove weld is to show no dimensions to the left of the groove weld symbol. This is the intent of 6.2.2. There are other ways by which complete joint penetration can be specified, including:

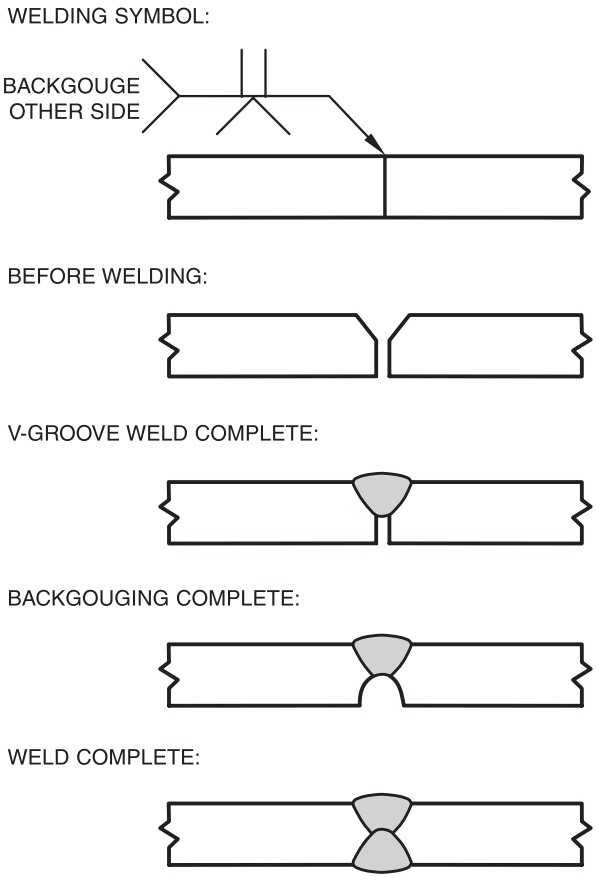


Figure D.2—Example of Complete Joint Penetration Sequence

Subclause 6.2.4—Use of nonsymmetrical and symmetrical double-groove welds,

Subclause 6.2.8—Inclusion of "CJP" in the tail of the welding symbol,

Subclause 6.7—Back or backing welds, and

Subclause 6.8—Joints with backing.

The provision in 6.2.8 is included for use on design drawings where there is insufficient information available as to what equipment might be used or, in some cases, what company or organization might do the work. For example, the design drawings might be completed prior to the job being submitted for bids. In these situations, it is considered good practice to require the successful bidder to submit construction drawings complete with detailed welding symbols for review. The other methods identified above require knowledge of the spe-

cific welding situation and also the requirements of any codes or specifications that might apply.

D6.2.10 Flare-Groove Welds. Although flare-groove welds are included in the section on groove welds, they must be treated as special cases since they do not conform to all of the accepted conventions associated with other types of groove welds. The dimensions corresponding to "depth of bevel" and "groove angle" in a normal groove weld are functions of the curvature of the base metal in a flare-groove weld and therefore beyond the usual controls of either the designer or the welder.

Of even greater importance is the concept of complete joint penetration, which is not attainable in many flare-groove welds since the fusion occurs along the surface of one or both members rather than through the thickness. The rate of curvature on one or both members is such that the actual obtainable weld size is usually only some fraction of the radius (see Figure D.3).

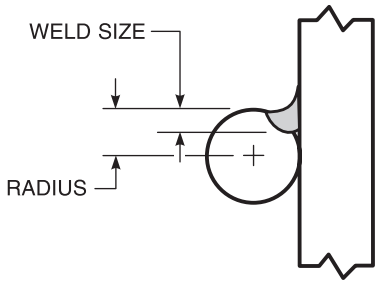


Figure D.3—Example of a Flare Groove

D6.12 Seal Welds. The primary function of a weld may be to contain fluids or gases; however; it will not perform this function if it cracks as a result of stresses caused by handling, storage, shipping, vibrations, temperature changes, and so forth. For these reasons, a seal weld may require careful consideration regarding dimensions of the groove as well as the type. It should be recognized that a welding symbol with only "SEAL WELD" in the tail and no other requirements will relegate such welding to the discretion of the fabrication shop, whose judgment and welding practice may not ensure the service performance of the joint as expected by the designer.

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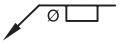
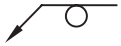
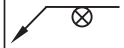
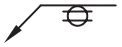
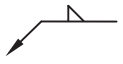
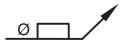
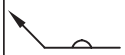
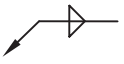
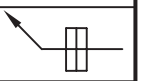
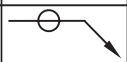
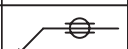
Annex E (Informative)
Welding Symbol Chart

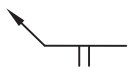
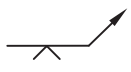
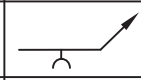
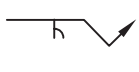
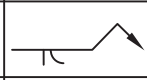
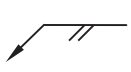
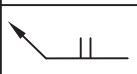
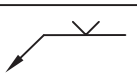
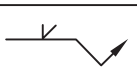
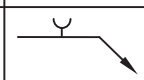
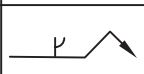
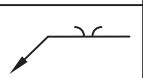
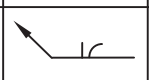
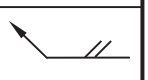
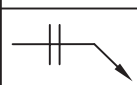
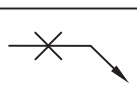
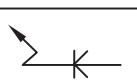
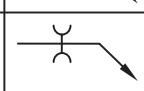
This annex is not part of AWS A2.4:2007, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*, but is included for informational purposes only.

The welding symbol chart included in AWS A2.4:2007 is intended to provide basic information and often-used symbols in a convenient form as a shop or drafting room aid. The chart is published separately from, but concurrently with, AWS A2.4 in both wall size and desk size formats. Over the years, the chart has been reproduced and distributed by other sources both with and without the permission of AWS. Consequently, many obsolete and error-filled versions are in existence. The reader is advised and cautioned that the only complete and approved version is in the latest edition of AWS A2.4.

American Welding Society Welding Symbol Chart

Basic Weld Symbols and Their Location Significance within the Welding Symbol

Location Significance	Fillet	Plug	Slot	Spot or Projection	Stud	Seam	Back or Backing	Surfacing	Edge
Arrow Side									
Other Side					Not Used			Not Used	
Both Sides		Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	
No Arrow Side or Other Side Significance	Not Used	Not Used	Not Used		Not Used		Not Used	Not Used	Not Used

Location Significance	Groove							Scarf for Brazed Joint
	Square	V	Bevel	U	J	Flare-V	Flare-Bevel	
Arrow Side								
Other Side								
Both Sides								
No Arrow Side or Other Side Significance	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

Supplementary Symbols

Weld-All-Around	Fillet Weld	Melt-Thru	Consumable Insert (Square)

Backing (Rectangle)	Spacer (Rectangle)	Contour		
		Flush or Flat	Convex	Concave

Basic Joint Types
Identification of Arrow Side and Other Side Joint

Butt Joint

Corner Joint

T-Joint

Lap Joint

Edge Joint

Standard Location of the Elements of a Welding Symbol

Letter Designations

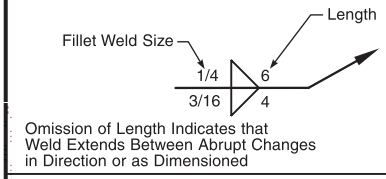
Where letter designations are to be included in the tail of the welding symbol, refer to Annex A (Normative) Tables of AWS A2.4:2007.

550 N.W. LeJeune Road
Miami, FL 33126
www.aws.org

American Welding Society Welding Symbol Chart

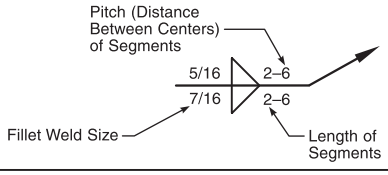
Typical Welding Symbols

Double-Fillet Welding Symbol

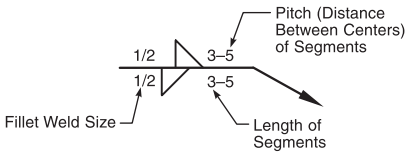


Omission of Length Indicates that Weld Extends Between Abrupt Changes in Direction or as Dimensioned

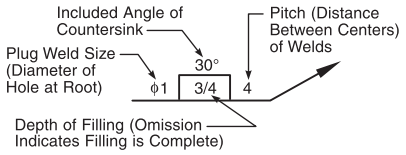
Chain Intermittent Fillet Welding Symbol



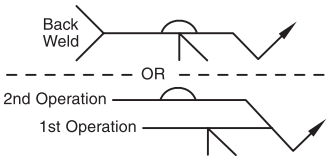
Staggered Intermittent Fillet Welding Symbol



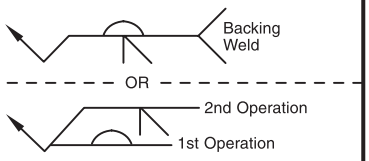
Plug Welding Symbol



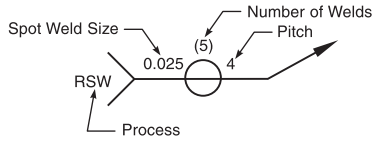
Back Welding Symbol



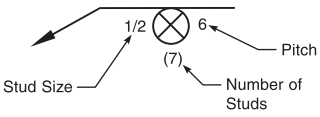
Backing Welding Symbol



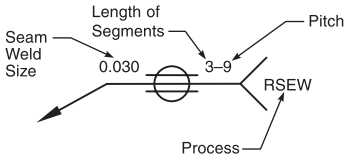
Spot Welding Symbol



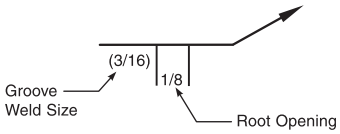
Stud Welding Symbol



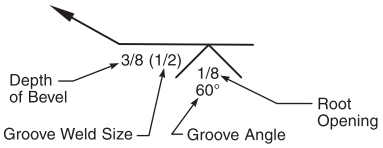
Seam Welding Symbol



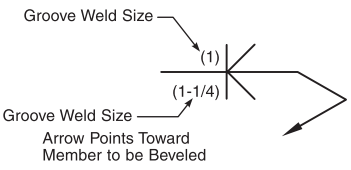
Square-Groove Welding Symbol



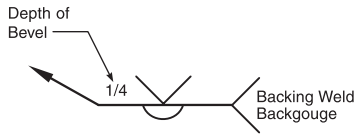
V-Groove Welding Symbol



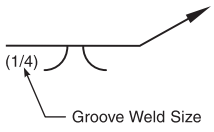
Double-Bevel-Groove Welding Symbol



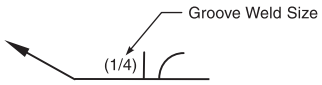
Symbol with Backgouging



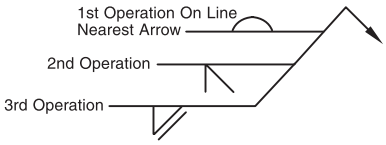
Flare-V-Groove Welding Symbol



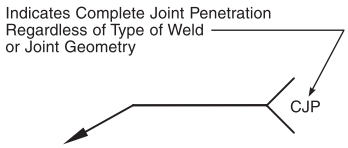
Flare-Bevel-Groove Welding Symbol



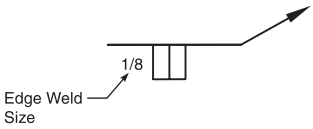
Multiple Reference Lines



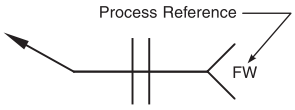
Complete Joint Penetration



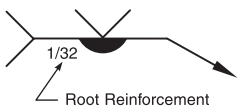
Edge Welding Symbol



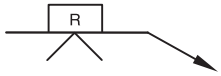
Flash or Upset Welding Symbol



Melt-Thru Symbol



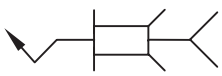
Joint with Backing



'R' Indicates Backing Removed After Welding

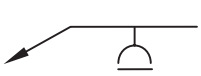
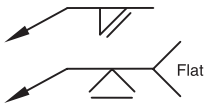
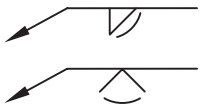
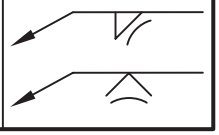
Joint with Spacer

With Modified Groove Weld Symbol



Double-Bevel Groove

Contour Symbols

Flush	Flat	Convex	Concave
	 Flat		

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Annex F (Informative)

Guidelines for the Preparation of Technical Inquiries

This annex is not part of AWS A2.4:2007, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*, but is included for informational purposes only.

F1. Introduction

The American Welding Society (AWS) Board of Directors has adopted a policy whereby all official interpretations of AWS standards are handled in a formal manner. Under this policy, all interpretations are made by the committee that is responsible for the standard. Official communication concerning an interpretation is directed through the AWS staff member who works with that committee. The policy requires that all requests for an interpretation be submitted in writing. Such requests will be handled as expeditiously as possible, but due to the complexity of the work and the procedures that must be followed, some interpretations may require considerable time.

F2. Procedure

All inquiries shall be directed to:

Managing Director
Technical Services Division
American Welding Society
550 N.W. LeJeune Road
Miami, FL 33126

All inquiries shall contain the name, address, and affiliation of the inquirer, and they shall provide enough information for the committee to understand the point of concern in the inquiry. When the point is not clearly defined, the inquiry will be returned for clarification. For efficient handling, all inquiries should be typewritten and in the format specified below.

F2.1 Scope. Each inquiry shall address one single provision of the standard unless the point of the inquiry involves two or more interrelated provisions. The provision(s) shall be identified in the scope of the inquiry along with the edition of the standard that contains the provision(s) the inquirer is addressing.

F2.2 Purpose of the Inquiry. The purpose of the inquiry shall be stated in this portion of the inquiry. The purpose can be to obtain an interpretation of a standard's requirement or to request the revision of a particular provision in the standard.

F2.3 Content of the Inquiry. The inquiry should be concise, yet complete, to enable the committee to understand the point of the inquiry. Sketches should be used whenever appropriate, and all paragraphs, figures, and tables (or annex) that bear on the inquiry shall be cited. If the point of the inquiry is to obtain a revision of the standard, the inquiry shall provide technical justification for that revision.

F2.4 Proposed Reply. The inquirer should, as a proposed reply, state an interpretation of the provision that is the point of the inquiry or provide the wording for a proposed revision, if this is what the inquirer seeks.

F3. Interpretation of Provisions of the Standard

Interpretations of provisions of the standard are made by the relevant AWS technical committee. The secretary of the committee refers all inquiries to the chair of the particular subcommittee that has jurisdiction over the portion of the standard addressed by the inquiry. The subcommittee reviews the inquiry and the proposed reply to determine what the response to the inquiry should be. Following the subcommittee's development of the response, the inquiry and the response are presented to the entire committee for review and approval. Upon approval by the committee, the interpretation is an official

interpretation of the Society, and the secretary transmits the response to the inquirer and to the *Welding Journal* for publication.

F4. Publication of Interpretations

All official interpretations will appear in the *Welding Journal* and will be posted on the AWS web site.

F5. Telephone Inquiries

Telephone inquiries to AWS Headquarters concerning AWS standards should be limited to questions of a general nature or to matters directly related to the use of the standard. The *AWS Board Policy Manual* requires that all AWS staff members respond to a telephone request for an official interpretation of any AWS standard with the information that such an interpretation can be obtained only through a written request. Headquarters staff cannot provide consulting services. However, the staff can refer a caller to any of those consultants whose names are on file at AWS Headquarters.

F6. AWS Technical Committees

The activities of AWS technical committees regarding interpretations are limited strictly to the interpretation of provisions of standards prepared by the committees or to consideration of revisions to existing provisions on the basis of new data or technology. Neither AWS staff nor the committees are in a position to offer interpretive or consulting services on (1) specific engineering problems, (2) requirements of standards applied to fabrications outside the scope of the document, or (3) points not specifically covered by the standard. In such cases, the inquirer should seek assistance from a competent engineer experienced in the particular field of interest.

Annex G (Informative)

Informative References

This annex is not part of AWS A2.4:2007, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*, but is included for informational purposes only.

American National Standards Institute (ANSI). *Y14 Series*. New York: American National Standards Institute.

AWS A1.1, *Metric Practice Guide for the Welding Industry*, American Welding Society.

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List of AWS Documents on Definitions and Symbols

Designation	Title
A2.1-WC*	*Welding Symbol Chart* (Wall Size)*
A2.1-DC*	*Welding Symbol Chart* (Desk Size)*
A2.4	*Standard Symbols for Welding, Brazing, and Nondestructive Examination*
A3.0	*Standard Welding Terms and Definitions including Terms for Brazing, Soldering, Thermal Spraying, and Thermal Cutting*

*A reproduction of the charts is shown in Annex E. It should be understood that these charts are intended only as shop aids. The only complete and official presentation of the Standard Welding Symbols is in A2.4.

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