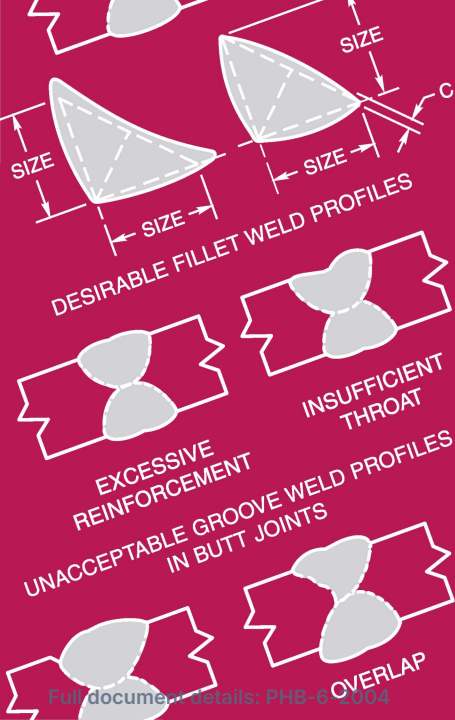
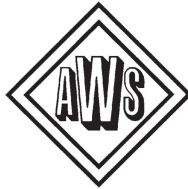




The Everyday Pocket Handbook for Visual Inspection of AWS D1.1 Structural Welding Code's Fabrication and Welding Requirements



Number 6 in a series

Excerpted requirements selected as a useful tool for on-the-job welding personnel by the AWS Product Development Committee

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American Welding Society

NOTE: Although care was taken in choosing and presenting the data in this guide, AWS cannot guarantee that it is error free. Further, this guide is not intended to be an exhaustive treatment of the topic and therefore may not include all available information, including with respect to safety and health issues. By publishing this guide, AWS does not insure anyone using the information it contains against any liability or injury to property or persons arising from that use.

Introduction

The inspection requirements for the fabrication and welding of steel structures are very extensive. This Pocket Handbook has been developed to provide a useful tool for inspectors to carry in their pockets or tool kits so that selected pertinent portions of the AWS *Structural Welding Code—Steel*, D1.1/D1.1M:2004, can be easily referenced at the job site. Underlining is as shown in the code.

This publication is not to be considered as a substitute for the D1.1 code book. Rather, the Handbook is provided as a supplemental aid for the “deckplate” inspector. Only the complete code should be considered as the official document to ensure that all of the quality attributes required for structural fabrication are performed correctly and completely.

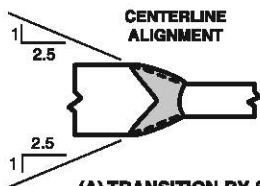
To assist the inspector, or other user, in verifying conformance to D1.1, the paragraph references, the table numbers, and the figure numbers contained in this book are directly from the D1.1/D1.1M:2004 code. In addition, page numbering in this handbook is cross-referenced to reflect both the current page and the corresponding page from the D1.1/D1.1M:2004 code, separated by a “/.” This will provide an easy cross reference for the user to ensure that the complete requirements are understood when questions develop during the course of any inspection.

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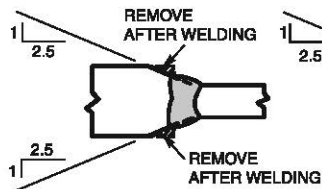
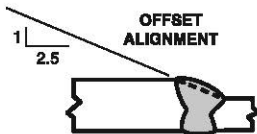
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Requirements for Transitions Between Materials of Unequal Thickness

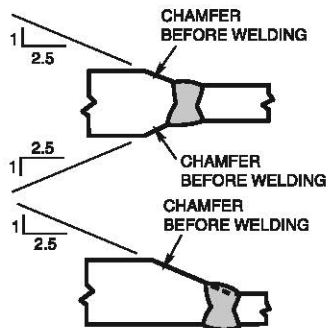
WELDED FROM TWO SIDES



(A) TRANSITION BY SLOPING WELD SURFACE



(B) TRANSITION BY SLOPING WELD SURFACE AND CHAMFERING



(C) TRANSITION BY CHAMFERING THICKER PART

General Notes:

- Groove may be of any allowed or qualified type and detail.
- Transition slopes shown are the maximum allowed.

Figure 2.21—Transition of Thickness of Butt Joints in Pairs of Unequal Thickness (Tubular) (see 2.25 [pg. 22])

Requirements for Transitions Between Materials of Unequal Thickness

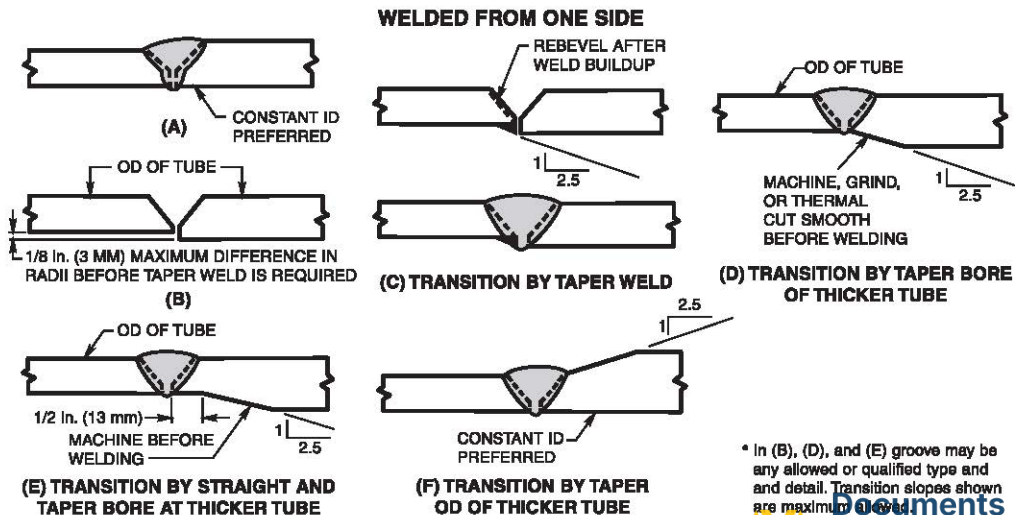


Figure 2.21 (Cont'd)—Transition of Thickness of Butt Joints in Parts of Unequal Thickness (Tubular) (see 2.25 [pg. 22])

Requirements for Transitions Between Materials of Unequal Thickness

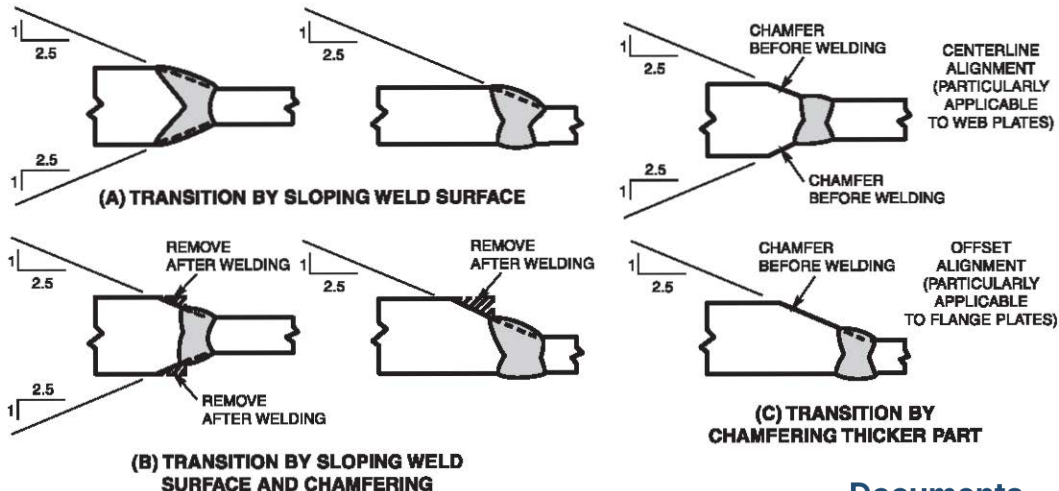


Figure 2.2—Transition of Butt Joints in Parts of Unequal Thickness (Noncylindrical)
(see 2.7.1 [pg. 10] and 2.16.1.1 [pg. 14])

Requirements for Transitions Between Materials of Unequal Thickness

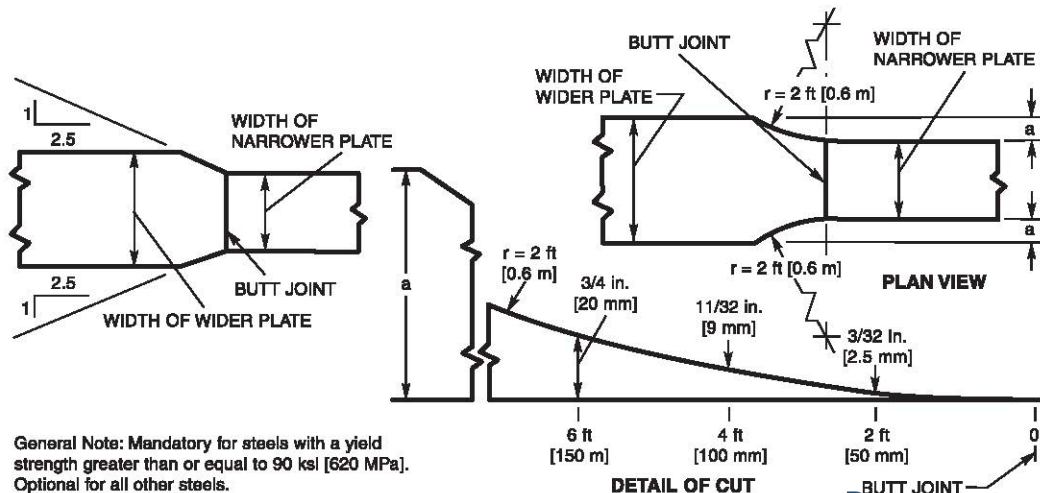


Figure 2.12—Transition of Width (Cyclically Loaded Nontubular) (see 2.13.12 [pg 14])

Thermal Cutting and Access Hole Requirements

5.15.4.3 Roughness Requirements. In thermal cutting, the equipment shall be so adjusted and manipulated as to avoid cutting beyond (inside) the prescribed lines. The roughness of all thermal cut surfaces shall be no greater than that defined by the American National Standards Institute surface roughness value of 1000 $\mu\text{in.}$ [25 μm] for material up to 4 in. [100 mm] thick and 2000 $\mu\text{in.}$ [50 μm] for material 4 in. to 8 in. [200 mm] thick, with the following exception: the ends of members not subject to calculated stress at the ends shall not exceed a surface roughness value of 2000 $\mu\text{in.}$ ANSI/ASME B46.1, *Surface Texture (Surface Roughness, Waviness, and Lay)* is the reference standard. AWS *Surface Roughness Guide for Oxygen Cutting* (AWS C4.1-77) may be used as a guide for evaluating surface roughness of these edges. For materials up to and including 4 in. [100 mm] thick, Sample No. 3 shall be used, and for materials over 4 in. up to 8 in. [200 mm] thick, Sample No. 2 shall be used.

5.15.4.4 Gouge or Notch Limitations. Roughness exceeding these values and notches or gouges not more than 3/16 in. [5 mm] deep on other wise satisfactory surfaces shall be removed by machining or grinding. Notches or gouges exceeding 3/16 in. [5 mm] deep may be repaired by grinding if the nominal cross-sectional area is not reduced by more than 2%. Ground or machined surfaces shall be fared to the original surface with a slope not exceeding one in ten. Cut surfaces and adjacent edges shall be left free of slag. In thermal-cut surfaces, occasional notches or gouges may, with approval of the Engineer, be repaired by welding.

5.16 Reentrant Corners

Reentrant corners of cut material shall be formed to provide a gradual transition with a radius of not less than 1 in. [25 mm]. Adjacent surfaces shall meet without offset or cutting past the point of tangency.

The reentrant corners may be formed by thermal cutting, followed by grinding, if necessary, to meet the surface requirements of 5.15.4.3.

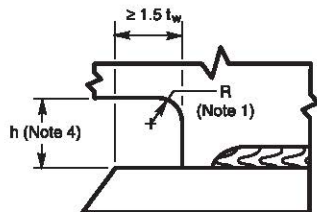
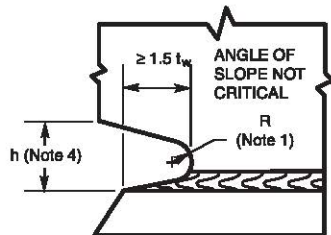
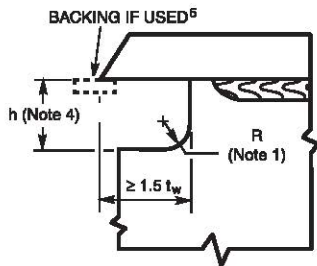
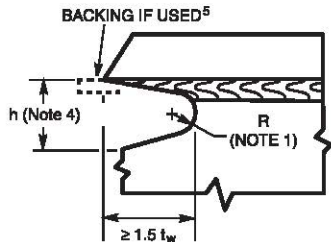
5.17 Beam Copes and Weld Access Holes

Radii of beam copes and weld access holes shall provide a smooth transition free of notches or cutting past the points of tangency between adjacent surfaces and shall meet the surface requirements of 5.15.4.3.

5.17.1 Weld Access Hole Dimensions. All weld access holes required to facilitate welding operations shall have a length (ℓ) from the toe of the weld preparation not less than 1-1/2 times the thickness of the material in which the hole is made. The height (h) of the access hole shall be adequate for deposition of sound weld metal in the adjacent plates and provide clearance for weld tabs for the weld in the

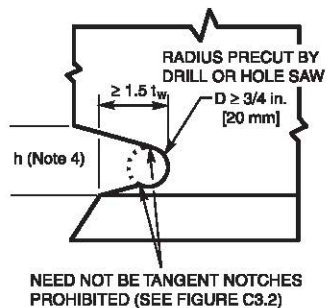
material in which the hole is made, but not less than the thickness of the material. In hot rolled shapes and built-up shapes, all beam copes and weld access holes shall be shaped free of notches or sharp reentrant corners except that when fillet web-to-flange welds are used in built-up shapes, access holes may terminate perpendicular to the flange. Fillet welds shall not be returned through weld access holes (see Figure 5.2).

5.17.2 Group 4 and 5 Shapes. For ASTM A6 Group 4 and 5 shapes and built-up shapes with web material thickness greater than 1-1/2 in. [40 mm], the thermally cut surfaces of beam copes and weld access holes shall be ground to bright metal and inspected by either MT or PT. If the curved transition portion of weld access holes and beam copes are formed by pre-drilled or sawed holes, that portion of the access hole or cope need not be ground. Weld access holes and beam copes in other shapes need not be ground nor inspected by MT or PT.



ROLLED SHAPE OR GROOVE WELDED SHAPE²

FILLET WELDED SHAPE³



**OPTIONAL METHOD FOR
MAKING CORNER RADIUS**

Figure 5.2—Weld Access Hole Geometry (see 5.17.1 [pg. 185])

General Notes:

For ASTM A 6 Group 4 and 5 shapes and welded built-up shapes with web thickness more than 1-1/2 in. [40 mm], preheat to 150°F [65°C] prior to thermal cutting, grind and inspect thermally cut edges of access hole using MT or PT methods prior to making web and flange splice groove welds.

These are typical details for joints welded from one side against steel backing. Alternative joint designs should be considered.

Notes:

1. Radius shall provide smooth notch-free transition; $R \geq 3/8$ in. [10 mm] (Typical 1/2 in. [12 mm]).
2. Access hole made after welding web to flange.
3. Access hole made before welding web to flange. Weld not returned through hole.
4. $h_{\min} = 3/4$ in. [20 mm] or t_w (web thickness), whichever is greater.

Figure 5.2 (Cont'd)—Weld Access Hole Geometry (see 5.17.1 [pg. 185])