

**AWS D1.1/D1.1M:2015**  
**An American National Standard**



# **Structural Welding Code— Steel**



**AWS D1.1/D1.1M:2015**  
**An American National Standard**

**Approved by the**  
**American National Standards Institute**  
**July 28, 2015**

# **Structural Welding Code—** **Steel**

**23rd Edition**

**Supersedes AWS D1.1/D1.1M:2010**

Prepared by the  
American Welding Society (AWS) D1 Committee on Structural Welding

Under the Direction of the  
AWS Technical Activities Committee

Approved by the  
AWS Board of Directors

## **Abstract**

This code covers the welding requirements for any type of welded structure made from the commonly used carbon and low-alloy constructional steels. Clauses 1 through 9 constitute a body of rules for the regulation of welding in steel construction. There are nine normative and eleven informative annexes in this code. A Commentary of the code is included with the document.



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## Dedication

This 23rd edition of AWS D1.1/D1.1M:2015, *Structural Welding Code—Steel*, is dedicated by the D1 Committee on Structural Welding and the D1Q Subcommittee on Steel Structures to Keith Landwehr. In his 15 years of service, Keith contributed 30 years of expertise to the development of the D1.1, *Structural Welding Code—Steel*, D1.4, *Structural Welding Code—Reinforcing Steel*, D1.8, *Structural Welding Code—Seismic Supplement*, and other national standards. The D1 community will forever miss Keith for his commitment, but more importantly, for his friendship and wise counsel, and hopes that this dedication will inspire the structural welding community to excellence as Keith did in his service.

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J. L. Uebele	<i>Waukesha County Technical College</i>
P. Workman	<i>Tru-Weld Equipment Company</i>

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J. Guili	<i>Tru-Weld Equipment Company</i>
S. Schraff	<i>Nelson Stud Welding</i>
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J. A. Packer	<i>University of Toronto</i>
R. Sause	<i>ATLSS Center Lehigh University</i>

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J. J. Edwards	<i>DOT Quality Services</i>
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B. M. Butler	<i>Walt Disney World Company</i>
C. W. Hayes	<i>The Lincoln Electric Company</i>
M. L. Hoitomt	<i>Consultant</i>
J. B. Pearson, Jr.	<i>LTK Engineering Services</i>
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## Foreword

This foreword is not part of AWS D1.1/D1.1M:2015, *Structural Welding Code—Steel*, but is included for informational purposes only.

The first edition of the *Code for Fusion Welding and Gas Cutting in Building Construction* was published by the American Welding Society in 1928 and called Code 1 Part A. It was revised in 1930 and 1937 under the same title. It was revised again in 1941 and given the designation D1.0. D1.0 was revised again in 1946, 1963, 1966, and 1969. The 1963 edition published an amended version in 1965, and the 1966 edition published an amended version in 1967. The code was combined with D2.0, *Specifications for Welding Highway and Railway Bridges*, in 1972, given the designation D1.1, and retitled *AWS Structural Welding Code*. D1.1 was revised again in 1975, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1988, 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008 and 2010. A second printing of D1.1:2010 was published in 2011. From 1972 to 1988, the D1.1 code covered the welding of both buildings and bridges. In 1988, AWS published its first edition of AASHTO/AWS D1.5, *Bridge Welding Code*; coincident with this, the D1.1 code changed references of buildings and bridges to statically loaded and dynamically loaded structures, respectively, in order to make the document applicable to a broader range of structural applications. After the publishing of the 2010 edition, it was decided that the *AWS Structural Welding Code—Steel* would be published on a five year revision cycle instead of a two year revision cycle. This was done in order to sync the publication cycle of AWS Structural Welding Code-Steel with the publication cycles of the AISC Steel Building Specification and the International Building Code. This 2015 edition is the 23rd edition of D1.1.

Underlined text in the clauses, subclauses, tables, figures, or forms indicates a change from the 2010 edition. A vertical line in the margin of a table or figure also indicates a change from the 2010 edition.

The following is a summary of the most significant technical changes contained in D1.1/D1.1M:2015:

The 2015 edition of the code has been reorganized. The tubular provisions, tables, and figures previously located throughout the code are now within Clause 9 entitled “Tubular Structures.” The reorganization required numerous reference changes and renumbering of the subclauses, tables, and figures. Many of the tables in Clause 4 contained provisions for Plate as well as Pipe or Tubing. The tables have been divided to only include Plate if contained in Clause 4 and Pipe or Tubing if contained in Clause 9. This separation of the information contained in the tables also resulted in many changes to the footnotes delineated in the tables.

Clauses 1, 7, and 8 have only been slightly impacted by the reorganization. However, Clauses 2, 3, 4, 5, and 6 have been greatly impacted with the reorganization.

## Summary of Changes

Clause/Table/ Figure/Annex	Modification
Clause 2	The most significant change to Clause 2 from the 2010 edition is that Part D entitled “Specific Requirements for Design of Tubular Connections (Statically or Cyclically Loaded)” has been relocated to Clause 9.
2.4.2.7	Additional language was added regarding the calculation of effective throat of a combination PJP flare bevel groove weld and fillet weld.

## Summary of Changes (Continued)

Clause/Table/ Figure/Annex	Modification
2.9.3.5	Added provisions for wrapping welds on opposite sides of a common plane to permit seal welding.
Table 2.5	Fatigue curve cases and figures revised to agree with AISC 360.
3.7.4	Shielding gas provisions revised to permit the use of electrodes classified to AWS A5.36.
3.13.2.1	New subclause that provides conditions under which backing other than steel may be used in prequalified WPSs.
Table 3.1	Reformatted the table moving filler metals in corresponding groups in Table 3.2. Updated the list of base metals permitted in prequalified WPSs and corrected the group of some base metal grades.
Table 3.2	New table for filler metal requirements that contains the information previously contained in Table 3.1 with the addition of a classification for A5.36 for carbon and low-alloy steel electrodes for FCAW and metal cored electrodes for GMAW processes.
Table 3.3	(Previously Table 3.2) Revised the base metals to correspond with those in Table 3.1
Table 3.4	(Previously Table 3.3) Addition of AWS A5.36.
Table 3.7	(Previously Table 3.6) Clarification of a SAW parameter variable.
Notes for Figures 3.2 and 3.3	Addition of note “O” permitting various orientations of connected elements in CJP Groove, T-, and Corner joints.
Figure 3.5	New figure for prequalified fillet weld joint details.
Figure 3.6	New figure for prequalified CJP groove, T-, and corner joints.
4.12.3	Restructured for easier reading.
4.21	(Previously 4.25, 4.26, 4.30) Reorganized “Extent of Qualification.”
4.27.7	(Previously 4.36.7) Clarified CVN Test requirements when sub-sized specimens are tested.
Tables 4.1, 4.2, 4.3, 4.4, 4.10, and 4.11	The information found in the tables that referenced pipes and tubing are now contained in the tables found in Clause 9.
Tables 4.5, 4.6, and 4.9	Added provisions for electrodes classified to AWS A5.36.
5.3.2.5	Additional language and clarification regarding baking requirements when welding with low-hydrogen electrodes for ASTM A514 and A517 steels.
5.3.4	Reorganized the list of AWS Filler metal specifications for GMAW and FCAW as well as added AWS A5.36.
5.6	Clarified language regarding preheat and interpass temperatures.
5.7	Moved language regarding oxygen gouging to 5.14.6 and 5.25.
5.8.1	Revised for clarification.
5.8.3	Revised to delete ASTM A709 100 (690) and 100W (690W) and to include ASTM A709 Grade HPS 100W [HPS 690W] per ASTM.
5.9	(Previous 5.9 entitled “Backing, Backing Gas, or Inserts” was deleted) (Previously 5.10) Restructured for clarification.

## Summary of Changes (Continued)

Clause/Table/ Figure/Annex	Modification
5.9.1.3	(Previously 5.10.3) “Backing Thickness” was revised to make a general requirement that steel backing be of sufficient thickness to prevent melt-through. The explicit thicknesses previously required were moved to commentary as recommendations.
5.14.1–5.14.4	(Previously 5.15) Substrate cleanliness requirements were significantly revised.
5.14.6	(Previously 5.15.2) Revised to clarify when oxygen gouging is permitted.
5.17.2	(Previously 5.18.2) Revised for clarity regarding when locations of the depth of the web from tension flanges of beams or girders are considered outside the tension zone.
5.19	(Previously 5.20) Revised provisions regarding the location and sequence of member and element splices.
5.25	(Previously 5.26) Revised to limit oxygen gouging to as-rolled steels.
Table 5.8	(Previously Table 5.9) Note c revised to clarify when welds are exempt from reinforcement and convexity limitations.
Table 5.9	(Previously Table 5.10) Minimum allowable convexity was eliminated from Schedule D for outside corner joints. Table footnote b was rewritten regarding restriction on convexity was replaced with a note regarding concavity and now applies to Schedules B and D.
6.4.2	Revised to clarify as to what a welder, welding operator, or tack welder must demonstrate, when their work appears to be below the requirements of the code.
6.4.3	Revised to include tack welder.
6.10	Revised to replace “applicable requirements” with “acceptance criteria.”
6.11	Revised to remove ASTM A709 Grades 100 and 100W and include ASTM A709 Grade HPS 100W [HPS 690W].
6.21.1	(Previously 6.22.1) Reference added to new Table 6.8 showing qualification and calibration requirements.
6.24.2	Revised to clarify when calibration for sensitivity and horizontal sweep shall be made.
Table 6.1	Revised to remove ASTM A709 Grades 100 and 100W and include ASTM A709 Grade HPS 100W [HPS 690W].
Tables 6.4 and 6.5	Revised to remove the tubular provisions, now contained in Tables found in Clause 9.
Table 6.8	New table added to clarify UT equipment qualification and calibration requirements.
Clause 9	The tubular provisions extracted from the 2010 code were virtually unchanged when relocated to Clause 9.
9.6.1.6	(Previously 2.25.1.6) The definition of $1_2$ was revised to remove the word “chord.”
9.18	(Previously 4.21) Revised to clarify what type of welds do not require tubular qualification.
Table 9.1	New table developed from the tubular provisions contained in Table 2.5 of the previous edition. The content pertinent to nontubular members remained in Table 2.5
Tables 9.9, 9.10, 9.11, 9.12, 9.13, and 9.14	New tables developed from the tubular provisions in the previous edition of Clause 4. The content pertinent to nontubular members remains in Clause 4.

## Summary of Changes (Continued)

Clause/Table/ Figure/Annex	Modification
Tables 9.16, 9.17, 9.18, and 9.19	New tables developed from the tubular provisions in the previous edition of Clause 6. The content pertinent to nontubular members remains in Clause 6.
Table 9.5	(Previously Table 2.9) Addition of footnote “a” for clarification.
Figure 9.6	(Previously Figure 2.18) Dimension labels in the figure were revised for clarification.
Figure 9.29	(Previously Figure 6.4) Footnotes revised to remove the exception for T-, Y-, and K-connections.
Figure 9.30	(Previously Figure 6.5) Note to disregard discontinuities below the scanning level was deleted from the figure and the placement of the Accumulative Discontinuities arrow was revised for clarification.
Annex A	Figures added to clarify effective throat for various joint types and combinations.
Annex I	(Previously Annex J) Definitions for the symbols $l_2$ , $r_m$ , $t_w$ were revised and a new symbol $r_w$ and its definition were added corresponding to changes in Figure 9.6.
Annex J	(Previously Annex K) Terms and definitions are now considered normative, meaning that they include mandatory elements for use with this code. There was also the addition of new terms “fin” and “nondestructive testing (NDT).”
Annex M	(Previously Annex N) Sample welding forms were extensively revised for clarification.
Annex R	Annex R entitled “Safe Practices” was eliminated in this edition. Readers are referred in Clause 1 to other publications for safety provision.
Annex U	New Annex regarding AWS A5.36 filler metal classifications and properties.

## Summary of Clauses in D1.1:2010 Relocated to Clause 9 in D1.1:2015

D1.1:2010 Clause	D1.1:2015 Clause and Title
2.20	9.1 General
2.21	9.2 Allowable Stresses
2.20.1	9.2.1 Eccentricity
2.21.1	9.2.2 Base Metal Stresses
2.21.2	9.2.3 Tubular Section Limitations
2.21.3	9.2.4 Weld Stresses
2.21.4	9.2.5 Fiber Stresses
2.21.5	9.2.6 Load and Resistance Factor Design
2.21.6	9.2.7 Fatigue of Circular Tube Connections
2.21.6.1	9.2.7.1 Stress Range and Member Type
2.21.6.2	9.2.7.2 Fatigue Stress Categories
2.21.6.3	9.2.7.3 Basic Allowable Stress Limitation

### Summary of Clauses in D1.1:2010 Relocated to Clause 9 in D1.1:2015 (Continued)

D1.1:2010 Clause	D1.1:2015 Clause and Title
2.21.6.4	9.2.7.4 Cumulative Damage
2.21.6.5	9.2.7.5 Critical Members
2.21.6.6	9.2.7.6 Fatigue Behavior Improvement
2.21.6.7	9.2.7.7 Size and Profile Effects
2.22	9.3 Identification
2.23	9.4 Symbols
2.24	9.5 Weld Design
2.24.1	9.5.1 Fillet Welds
2.24.1.1	9.5.1.1 Effective Area
2.24.1.2	9.5.1.2 Beta Limitation for Prequalified Details
2.24.1.3	9.5.1.3 Lap Joints
2.24.2	9.5.2 Groove Welds
2.24.2.1	9.5.2.1 Prequalified PJP Groove Weld Details
2.24.2.2	9.5.2.2 Prequalified CJP Groove Weld Details Welded from One Side without Backing in T-, Y-, and K-Connections
2.24.3	9.5.3 Stresses in Welds
2.24.4	9.5.4 Circular Connections Lengths
2.24.5	9.5.5 Box Connection Lengths
2.24.5.1	9.5.5.1 K- and N-Connections
2.24.5.2	9.5.5.2 T-, Y- and X-Connections
2.25	9.6 Limitations of the Strength of Welded Connections
2.25.1	9.6.1 Circular T-, Y-, and K-Connections
2.25.1.1	9.6.1.1 Local Failure
2.25.1.2	9.6.1.2 General Collapse
2.25.1.3	9.6.1.3 Uneven Distribution of Load (Weld Sizing)
2.25.1.4	9.6.1.4 Transitions
2.25.1.5	9.6.1.5 Other Configurations and Loads
2.25.1.6	9.6.1.6 Overlapping Connections
2.25.2	9.6.2 Box T-, Y-, and K-Connections
2.25.2.1	9.6.2.1 Local Failure
2.25.2.2	9.6.2.2 General Collapse
2.25.2.3	9.6.2.3 Uneven Distribution of Load (Effective Width)
2.25.2.4	9.6.2.4 Overlapping Connections

### Summary of Clauses in D1.1:2010 Relocated to Clause 9 in D1.1:2015 (Continued)

D1.1:2010 Clause	D1.1:2015 Clause and Title
2.25.2.5	9.6.2.5 Bending
2.25.2.6	9.6.2.6 Other Configurations
2.26	9.7 Thickness Transition
2.27	9.8 Material Limitations
2.27.1	9.8.1 Limitations
2.27.1.1	9.8.1.1 Yield Strength
2.27.1.2	9.8.1.2 Reduced Effective Yield
2.27.1.3	9.8.1.3 Box T-, Y-, and K-Connections
2.27.1.4	9.8.1.4 ASTM A500 Precaution
2.27.2	9.8.2 Tubular Base Metal Notch Toughness
2.27.2.1	9.8.2.1 CVN Test Requirements
2.27.2.2	9.8.2.2 LAST Requirements
2.27.2.3	9.8.2.3 Alternative Notch Toughness
3.9	9.9 Fillet Weld Requirements
3.9.2	9.9.1 Details
3.12	9.10 PJP Requirements
3.12.4	9.10.1 Details
3.12.4.1	9.10.1.1 Matched Box Connections
3.13	9.11 CJP Groove Weld Requirements
3.13.4	9.11.1 Butt Joints
3.13.5	9.11.2 Tubular T-, Y-, and K-Connections
3.13.5.1	9.11.2.1 Joint Details
4.3	9.12 Common Requirements for WPS and Welding Personnel Performance Qualification
4.3.4	9.12.1 Positions of Welds
4.4	9.13 Production Welding Positions Qualified
4.5, 4.9, 4.9.1.1(6)(b), 4.9.2.1	9.14 Type of Qualification Tests, Methods of Testing and Acceptance Criteria for WPS Qualification
4.13	9.15 CJP Groove Welds for Tubular Connections
4.13.1	9.15.1 CJP Butt Joints with Backing or Backgouging
4.13.2	9.15.2 CJP Butt Joints without Backing Welded from One Side Only
4.13.3	9.15.3 T-,Y-, or K-Connections with Backing or Backgouging
4.13.4	9.15.4 T-,Y-, or K-Connections without Backing Welded from One Side Only
4.13.4.1	9.15.4.1 WPSs without Prequalified Status

### Summary of Clauses in D1.1:2010 Relocated to Clause 9 in D1.1:2015 (Continued)

D1.1:2010 Clause	D1.1:2015 Clause and Title
4.13.4.2	9.15.4.2 CJP Groove Welds in a T-,Y-, or K-Connection with WPS with Dihedral Angles Less than 30°
4.13.4.3	9.15.4.3 CJP Groove Welds in a T-,Y-, or K-Connection WPS Using GMAW-S
4.13.4.4	9.15.4.4 Welding Requiring CVN Toughness
4.14	9.16 PJP and Fillet Welds Tubular T-, Y-, or K-Connections and Butt Joints
4.19.1	9.17 Production Welding Positions, Thicknesses and Diameters Qualified
4.19.1.1, 4.19.2.1	9.17.1 Welders and Welding Operators
4.19.2.2, 4.20.2.1	9.17.2 Tack Welders
4.21	9.18 Weld Types for Welder and Welding Operator Performance Qualification
4.27	9.19 CJP Groove Welds for Tubular Connections
4.27.1	9.19.1 Other Joint Details or WPSs
4.28	9.20 PJP Groove Welds for Tubular Connections
4.29	9.21 Fillet Welds for Tubular Connections
4.31	9.22 Methods of Testing and Acceptance Criteria for Welder and Welding Operator Qualification
4.31.2.2	9.22.1 Macroetch Test for T-, Y-, and K-Connections
4.31.2.3(3)	9.22.1.1 Macroetch Test Acceptance Criteria
4.31.3.1	9.22.2 RT Test Procedure and Technique
5.10	9.23 Backing
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5.22	9.24 Tolerance of Joint Dimensions
5.22.3.1	9.24.1 Girth Weld Alignment (Tubular)
5.22.4	9.24.2 Groove Dimensions
5.22.4.2	9.24.2.1 Tubular Cross-Sectional Variations
6.9	9.25 Visual Inspection
6.11	9.26 NDT
6.7	9.26.1 Scope
6.11.1	9.26.2 Tubular Connection Requirements
6.13	9.27 UT
6.13.3	9.27.1 Acceptance Criteria for Tubular Connections
6.13.3.1	9.27.1.1 Class R (Applicable When UT is Used as an Alternate to RT)
6.13.3.2	9.27.1.2 Class X (Experience-Based, Fitness-for Purpose Criteria Applicable to T-,Y- and K-Connections in Structures with Notch-Toughness Weldments)
6.17	9.28 RT Procedures

### Summary of Clauses in D1.1:2010 Relocated to Clause 9 in D1.1:2015 (Continued)

D1.1:2010 Clause	D1.1:2015 Clause and Title
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6.17.7	9.28.2 IQI Selection and Placement
6.18	9.29 Supplementary RT Requirements for Tubular Connections
6.18.1	9.29.1 Circumferential Groove Welds in Butt Joints
6.18.1.1	9.29.1.1 Single-Wall Exposure/Single-Wall View
6.18.1.2	9.29.1.2 Double-Wall Exposure/Single-Wall View
6.18.1.3	9.29.1.3 Double-Wall Exposure/Double-Wall View
6.27	9.30 UT of Tubular T-, Y-, and K-Connections
6.27.1	9.30.1 Procedure.
6.27.2	9.30.2 Personnel
6.27.3	9.30.3 Calibration
6.27.3.1	9.30.3.1 Range
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6.27.4	9.30.4 Base Metal Examination
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### Summary of Tables in D1.1:2010 Relocated to Clause 9 in D1.1:2015

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2.5	9.1 Fatigue Stress Design Parameters
2.6	9.2 Allowable Stresses in Tubular Connection Welds
2.7	9.3 Stress Categories for Type and Location of Material for Circular Sections
2.8	9.4 Fatigue Category Limitations on Weld Size or Thickness and Weld Profile (Tubular Connections)
2.9	9.5 Z Loss Dimensions for Calculating Prequalified PJP T-, Y-, and K-Tubular Connection Minimum Weld Sizes

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2.10	9.6 Terms for Strength of Connections (Circular Sections)
3.5	9.7 Joint Detail Applications for Prequalified CJP T-, Y-, and K-Tubular Connections
3.6	9.8 Prequalified Joint Dimensions and Groove Angles for CJP Groove Welds in Tubular T-, Y-, and K-Connections Made by SMAW, GMAW-S, and FCAW
4.1	9.9 WPS Qualification—Production Welding Positions Qualified by Pipe and Box Tube Tests
4.2	9.10 WPS Qualification—CJP Groove Welds: Number and Type of Test Specimens and Range of Thickness and Diameter Qualified
4.3	9.11 Number and Type of Test Specimens and Range of Thickness Qualified—WPS Qualification; PJP Groove Welds
4.4	9.12 Number and Type of Test Specimens and Range of Thickness Qualified—WPS Qualification; Fillet Welds
4.10	9.13 Welder and Welding Operator Qualification—Production Welding Positions Qualified by Pipe and Box Tube Tests
4.11	9.14 Welder and Welding Operator Qualification—Number and Type of Specimens and Range of Thickness and Diameter Qualified
5.5	9.15 Tubular Root Opening Tolerances Butt Joints Welded Without Backing
6.1	9.16 Visual Inspection Acceptance Criteria
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6.5	9.18 Wire IQI Requirements
6.6	9.19 IQI Selection and Placement

## Summary of Figures in D1.1:2010 Relocated to Clause 9 in D1.1:2015

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2.14	9.2 Parts of a Tubular Connection
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2.16	9.4 Tubular T-, Y-, and K-Connection Fillet Weld Footprint Radius
2.17	9.5 Punching Shear Stress
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3.10	9.16 Prequalified Joint Details for CJP Groove Welds in Tubular T-, Y-, and K-Connections—Concave Improved Profile for Heavy Sections or Fatigue
4.4	9.17 Positions of Test Pipe or Tubing for Groove Welds
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4.7	9.19 Location of Test Specimens on Welded Test Pipe—WPS Qualification
4.8	9.20 Location of Test Specimens for Welded Box Tubing—WPS Qualification
4.20	9.21 Pipe Fillet Weld Soundness Test-WPS Qualification
4.24	9.22 Tubular Butt Joint-Welder Qualification with and without Backing
4.25	9.23 Tubular Butt Joint-WPS Qualification with and without Backing
4.26	9.24 Acute Angle Heel Test (Restrains not Shown)
4.27	9.25 Test Joint for T-, Y-, and K-Connections without Backing on Pipe or Box Tubing ( $\geq 6$ in [150 mm] O.D.) -Welder and WPS Qualification
4.28	9.26 Test Joint for T-, Y-, and K-Connections without Backing on Pipe or Box Tubing ( $< 4$ in [100 mm] O.D.)-Welder and WPS Qualification
4.29	9.27 Corner Macroetch Test Joint for T-, Y-, and K-Connections without Backing on Box Tubing for CJP Groove Welds-Welder and WPS Qualification
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### Summary of Figures in D1.1:2010 Relocated to Clause 9 in D1.1:2015 (Continued)

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6.4	9.29 Class R Indications
6.5	9.30 Class X Indications
6.13	9.31 Single-Wall Exposure-Single-Wall View
6.14	9.32 Double-Wall Exposure-Single-Wall View
6.15	9.33 Double-Wall Exposure-Double-Wall (Elliptical) View, Minimum Two Exposures
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6.22	9.35 Scanning Techniques

**AWS B4.0, *Standard Methods for Mechanical Testing of Welds***, provides additional details of test specimen preparation and details of test fixture construction.

**Commentary.** The Commentary is nonmandatory and is intended only to provide insightful information into provision rationale.

**Normative Annexes.** These annexes address specific subjects in the code and their requirements are mandatory requirements that supplement the code provisions.

**Informative Annexes.** These annexes are not code requirements but are provided to clarify code provisions by showing examples, providing information, or suggesting alternative good practices.

**Index.** As in previous codes, the entries in the Index are referred to by subclause number rather than by page number. This should enable the user of the Index to locate a particular item of interest in minimum time.

**Errata.** It is the Structural Welding Committee's Policy that all errata should be made available to users of the code. Therefore, any significant errata will be published in the Society News Section of the *Welding Journal* and posted on the AWS web site at: <http://www.aws.org/technical/d1/>.

**Suggestions.** Your comments for improving AWS D1.1/D1.1M:2015, *Structural Welding Code—Steel* are welcome. Submit comments to the Managing Director, Technical Services Division, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166; telephone (305) 443-9353; fax (305) 443-5951; e-mail [info@aws.org](mailto:info@aws.org); or via the AWS web site <<http://www.aws.org>>.

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# Structural Welding Code—Steel

## 1. General Requirements

### 1.1 Scope

This code contains the requirements for fabricating and erecting welded steel structures. When this code is stipulated in contract documents, conformance with all provisions of the code shall be required, except for those provisions that the Engineer (see 1.4.1) or contract documents specifically modifies or exempts.

The following is a summary of the code clauses:

**1. General Requirements.** This clause contains basic information on the scope and limitations of the code, key definitions, and the major responsibilities of the parties involved with steel fabrication.

**2. Design of Welded Connections.** This clause contains requirements for the design of welded connections composed of tubular, or nontubular, product form members.

**3. Prequalification of WPSs.** This clause contains the requirements for exempting a Welding Procedure Specification (WPS) from the WPS qualification requirements of this code.

**4. Qualification.** This clause contains the requirements for WPS qualification and the performance qualification tests required to be passed by all welding personnel (welders, welding operators, and tack welders) to perform welding in accordance with this code.

**5. Fabrication.** This clause contains general fabrication and erection requirements applicable to welded steel structures governed by this code, including the requirements for base metals, welding consumables, welding technique, welded details, material preparation and assembly, workmanship, weld repair, and other requirements.

**6. Inspection.** This clause contains criteria for the qualifications and responsibilities of inspectors, acceptance criteria for production welds, and standard procedures for performing visual inspection and nondestructive testing (NDT).

**7. Stud Welding.** This clause contains the requirements for the welding of studs to structural steel.

**8. Strengthening and Repair of Existing Structures.** This clause contains basic information pertinent to the welded modification or repair of existing steel structures.

**9. Tubular Structures.** This clause contains exclusive tubular requirements. Additionally, the requirements of all other clauses apply to tubulars, unless specifically noted otherwise.

### 1.2 Limitations

The code was specifically developed for welded steel structures that utilize carbon or low alloy steels that are 1/8 in [3 mm] or thicker with a minimum specified yield strength of 100 ksi [690 MPa] or less. The code may be suitable to govern structural fabrications outside the scope of the intended purpose. However, the Engineer should evaluate such suitability, and based upon such evaluations, incorporate into contract documents any necessary changes to code requirements to address the specific requirements of the application that is outside the scope of the code. The Structural Welding Committee encourages the Engineer to consider the applicability of other AWS D1 codes for applications involving aluminum (AWS D1.2), sheet steel equal to or less than 3/16 in [5 mm] thick (AWS D1.3), reinforcing steel (AWS D1.4), and stainless steel (AWS D1.6), strengthening and repair of existing structures (AWS D1.7), seismic supplement (AWS D1.8), and titanium (AWS D1.9). The AASHTO/AWS D1.5 *Bridge Welding Code* was specifically developed for welding highway bridge components and is recommended for those applications.

### 1.3 Definitions

The welding terms used in this code shall be interpreted in conformance with the definitions given in the latest edition of AWS A3.0, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering,*