



Errata for AWS D1.1/D1.1M:2006, *Structural Welding Code—Steel* (updated 7/30/2007)

- Page 19----- Section 2.24.1.4—incorrect reference—correct reference from “Note 4” to “Note d”
- Page 68----- Table 3.2—new materials (ASTM A 1018 HSLAS and HSLAS-F, Grades 60 and 70, Class 2) were not added to Table 3.2 Category C—add new materials (ASTM A 1018 HSLAS and HSLAS-F, Grades 60 and 70, Class 2) to Table 3.2 Category C (see attached corrected pages)
- Page 68----- Table 3.2, Note 1—incorrect reference—correct reference from “3.5.3” to “3.5.2”
- Page 73----- Notes for Figures 3.3 and 3.4—incorrect reference in Note i—Correct reference in Note i from “Note 6” to “Note f”
- Page 126 ----- Section 4.12.4.1(1)—incorrect metric equivalent for outside diameter—correct “10 mm” to “100 mm”
- Pages 145-149 --- Table 4.10 and Table 4.11—incorrect references—correct all references to Figures 4.28 - 4.37 by increasing each by one, for example, Figure 4.28 correct to Figure 4.29 (see attached corrected pages)
- Page 147 ----- Table 4.11—incorrect reference—top row, change "Nominal Wall or Plate Thickness^c" to "Nominal Wall or Plate Thickness^d"
- Page 147 ----- Table 4.11—incorrect reference, two places—top row and middle of table, change "Dihedral Angles Qualified^g" to "Dihedral Angles Qualified^h"
- Page 151 ----- Table 4.14—incorrect metric value—third row, seventh column—change “15 [00]” to “15 [20]”
- Page 237 ----- Figure 6.1—note 3 reference to page 225 is incorrect—correct reference to page 236
- Page 240 ----- Figure 6.4—note 3 reference to page 225 is incorrect—correct reference to page 236

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Page 241 ----- Figure 6.5—note 3 reference to page 225 is incorrect—correct reference to page 236

Page 242 ----- Figure 6.6—note 3 reference to page 225 is incorrect—correct reference to page 236

Table 3.2 (Continued)

C a t e g o r y	Steel Specification		Welding Process	Thickness of Thickest Part at Point of Welding		Minimum Preheat and Interpass Temperature	
				in.	mm	°F	°C
C	ASTM A 572	Grades 60, 65	SMAW with low-hydrogen electrodes, SAW, GMAW, FCAW	1/8 to 3/4 incl.	3 to 20 incl.	50	10
	ASTM A 633	Grade E					
	API 5L	Grade X52					
	ASTM A 913 ^b	Grades 60, 65					
	ASTM A 710	Grade A, Class 2 (≤ 2 in. [50 mm])					
	ASTM A 710	Grade A, Class 3 (> 2 in. [50 mm])					
	ASTM A 709 ^c	Grade HPS70W					
	ASTM A 852 ^c						
	<u>ASTM A 1018 HSLAS</u>	<u>Grade 60 Class 2</u>					
	<u>Grade 70 Class 2</u>						
	<u>Grade 60 Class 2</u>						
	<u>Grade 70 Class 2</u>						
	Grade 60						
	Grade 60						
D	ASTM A 710	Grade A (All classes)	SMAW, SAW, GMAW, and FCAW with electrodes or electrode-flux combinations capable of depositing weld metal with a maximum diffusible hydrogen content of 8 ml/100 g (H8), when tested according to AWS A4.3.	All thicknesses $\geq 1/8$ in. [3 mm]		32 ^a	0 ^a
	ASTM A 913 ^b	Grades 50, 60, 65					

^a When the base metal temperature is below 32°F [0°C], the base metal shall be preheated to a minimum of 70°F [20°C] and the minimum interpass temperature shall be maintained during welding.

^b The heat input limitations of 5.7 shall not apply to ASTM A 913.

^c For ASTM A 709 Grade HPS70W and ASTM A 852 Grade 70, the maximum preheat and interpass temperatures shall not exceed 400°F [200°C] for thicknesses up to 1-1/2 in. [40 mm], inclusive, and 450°F [230°C] for greater thicknesses.

Notes:

1. For modification of preheat requirements for SAW with parallel or multiple electrodes, see 3.5.3.
2. See 5.12.2 and 5.6 for ambient and base-metal temperature requirements.
3. ASTM A 570 and ASTM A 607 have been deleted.

Table 4.10

Welder and Welding Operator Qualification—Production Welding Positions Qualified by Plate, Pipe, and Box Tube Tests (see 4.18.1)

Qualification Test		Production Plate Welding Qualified			Production Pipe Welding Qualified					Production Box Tube Welding Qualified				
Weld Type	Positions ^a	Groove CJP	Groove PJP	Fillet	Butt-Groove		T-, Y-, K-Groove		Fillet	Butt-Groove		T-, Y-, K-Groove		Fillet
					CJP	PJP	CJP	PJP		CJP	PJP	CJP	PJP	
P L A T E	Groove ^b	1G	F	F	F, H	F	F		F	F, H	F	F		F, H
		2G	F, H	F, H	F, H	F, H	F, H		F, H	F, H	F, H	F, H		F, H
		3G	F, H, V	F, H, V	F, H, V	F, H, V	F, H, V		F, H, V	F, H, V	F, H, V	F, H, V		F, H, V
	4G	F, OH	F, OH	F, H, OH	F, OH	F, OH		F, OH	F, H, OH	F, OH	F, OH		F, H, OH	
	3G + 4G	All	All	All (Note h)	All (Note c)	All (Note c)		All (Notes c,e)	All (Note h)	All (Note d)	All		All (Note e)	All (Note h)
F I L L E T	Fillet	1F			F				F					F
		2F			F, H				F, H					F, H
		3F			F, H, V				F, H, V					F, H, V
		4F			F, H, OH				F, H, OH					F, H, OH
	3F + 4F			All (Note h)				All (Note h)					All (Note h)	
Plug	Qualifies Plug and Slot Welding for Only the Positions Tested													
T U B U L A R	Groove ^a (Pipe or Box)	1G Rotated	F	F	F, H	F	F		F	F, H	F	F		F, H
		2G	F, H	F, H	F, H	F, H	F, H		F, H	F, H	F, H	F, H		F, H
		5G	F, V, OH	F, V, OH	F, V, OH	F, V, OH	F, V, OH		F, V, OH	F, V, OH	F, V, OH	F, V, OH		F, V, OH
	6G	All	All	All	All	All		All	All	All	All		All	
2G + 5G (Note i)	All	All	All (Note h)	All (Note f)	All (Note f)		All (Notes e, f)	All (Note h)	All	All		All (Note e)	All (Note h)	
6GR (Fig. 4.27)	All	All	All (Note h)	All (Notes d, f)	All (Note f)		All (Notes e, f)	All (Note h)	All (Note d)	All		All (Note e)	All (Note h)	
6GR (Fig. 4.27 & 4.29)	All	All	All (Note h)	All (Notes d, f)	All (Note f)		All (Notes e, f)	All (Note h)	All (Note d)	All		All (Notes e, g)	All (Note h)	
P I P E F I L L E T	Pipe Fillet	1F Rotated			F				F					F
		2F			F, H				F, H					F, H
		2F Rotated			F, H				F, H					F, H
		4F			F, H, OH				F, H, OH					F, H, OH
	5F			All (Note h)				All (Note h)					All (Note h)	

CJP—Complete Joint Penetration; PJP—Partial Joint Penetration

^a See Figures 4.3, 4.4, 4.5, and 4.6.

^b Groove weld qualification shall also qualify plug and slot welds for the test positions indicated.

^c Only qualified for pipe equal to or greater than 24 in. [600 mm] in diameter with backing, backgouging, or both.

^d Not qualified for joints welded from one side without backing, or welded from two sides without backgouging.

^e Not qualified for welds having groove angles less than 30° (see 4.12.4.2).

^f Qualification using box tubing (Figure 4.27) also qualifies welding pipe over 24 in. [600 mm] in diameter.

^g Pipe or box tubing is required for the 6GR qualification (Figure 4.27). If box tubing is used per Figure 4.27, the macroetch test may be performed on the corners of the test specimen (similar to Figure 4.29).

^h See 4.25 and 4.28 for dihedral angle restrictions for plate joints and tubular T-, Y-, K-connections.

ⁱ Qualification for welding production joints without backing or backgouging shall require using the Figure 4.24(A) joint detail. For welding production joints with backing or backgouging, either the Figure 4.24(A) or Figure 4.24(B) joint detail may be used for qualification.

^j The qualification of welding operators for electroslag welding (ESW) or electrogas welding (EGW) shall only apply for the position tested.

Notes:

1. Not applicable for welding operator qualification (see Table 4.12).

2. Footnotes shown at the bottom of a column box apply to all entries:

Table 4.11**Welder and Welding Operator Qualification—Number and Type of Specimens and Range of Thickness and Diameter Qualified (Dimensions in Inches) (see 4.18.2.1)**

(1) Test on Plate			Number of Specimens ^a				Qualified Dimensions					
Production Groove or Plug Welds			Face Bend ^b (Fig. 4.12)	Root Bend ^b (Fig. 4.12)	Side Bend ^b (Fig. 4.13)	Macro-etch	Nominal Plate, Pipe or Tube Thickness Qualified, in.					
Type of Test Weld (Applicable Figures)	Nominal Thickness of Test Plate (T) in.	Min					Max					
Groove (Fig. 4.31 or 4.32)	3/8	1	1	(Note c)	—	1/8	3/4 max ^d					
Groove (Fig. 4.21, 4.22, or 4.30)	3/8 < T < 1	—	—	2	—	1/8	2T max ^d					
Groove (Fig. 4.21, 4.22, or 4.30)	1 or over	—	—	2	—	1/8	Unlimited ^d					
Plug (Fig. 4.38)	3/8	—	—	—	2	1/8	Unlimited					
Production Fillet Welds (T-joint and Skewed)			Number of Specimens ^a				Qualified Dimensions		Dihedral Angles Qualified ^h			
Type of Test Weld (Applicable Figures)	Nominal Test Plate Thickness, T, in.	Fillet Weld Break	Macro-etch	Side Bend ^b	Root Bend ^b	Face Bend ^b	Nominal Plate Thickness Qualified, in.		Min	Max		
							Min	Max				
Groove (Fig. 4.31 or 4.32)	3/8	—	—	(Note c)	1	1	1/8	Unlimited	30°	Unlimited		
Groove (Fig. 4.31 or 4.32)	3/8 < T < 1	—	—	2	—	—	1/8	Unlimited	30°	Unlimited		
Groove (Fig. 4.21, 4.22, or 4.30)	≥ 1	—	—	2	—	—	1/8	Unlimited	30°	Unlimited		
Fillet Option 1 (Fig. 4.37)	1/2	1	1	—	—	—	1/8	Unlimited	60°	135°		
Fillet Option 2 (Fig. 4.33)	3/8	—	—	—	2	—	1/8	Unlimited	60°	135°		
Fillet Option 3 (Fig. 4.20) [Any diam. pipe]	> 1/8	—	1	—	—	—	1/8	Unlimited	30°	Unlimited		
(2) Tests on Pipe or Tubing ^f			Number of Specimens ^a						Nominal Pipe or Tube Size Qualified, in.		Nominal Plate, Pipe or Tube Wall Thickness ^d Qualified, in.	
Production CJP Groove Butt Joints			1G and 2G Positions Only			5G, 6G and 6GR Positions Only			Nominal Pipe or Tube Size Qualified, in.			
Type of Test Weld	Nominal Size of Test Pipe, in.	Nominal Test Thickness, in.	Face Bend ^b	Root Bend ^b	Side Bend ^b	Face Bend ^b	Root Bend ^b	Side Bend ^b	Min	Max	Min	Max
Groove	≤ 4	Unlimited	1	1	(Note c)	2	2	(Note c)	3/4	4	1/8	3/4
Groove	> 4	≤ 3/8	1	1	(Note c)	2	2	(Note c)	(Note e)	Unlimited	1/8	3/4
Groove	> 4	> 3/8	—	—	2	—	—	4	(Note e)	Unlimited	3/16	Unlimited

(continued)

Table 4.11 (Continued)

(2) Test on Pipe or Tubing ^f (cont'd)			Qualified Dimensions									
Production T-, Y-, or K-Connection CJP Groove Welds			Number of Specimens ^a		Nominal Pipe or Tube Size Qualified, in.		Nominal Wall or Plate Thickness ^c Qualified, in.		Dihedral Angles Qualified ^g			
Type of Test Weld	Nominal Size of Test Pipe, in.	Nominal Test Thickness, in.	Side Bend ^b	Macro- etch	Min	Max	Min	Max	Min	Max		
Pipe Groove (Fig. 4.27)	≥ 6 O.D.	≥ 1/2	4	—	4	Unlimited	3/16	Unlimited	30°	Unlimited		
<u>Pipe Groove</u> (Fig. 4.28)	< 4 O.D.	≥ 0.203	Note i	—	3/4	< 4	1/8	Unlimited	30°	Unlimited		
Box Groove (Fig. 4.29)	Unlimited	≥ 1/2	4	4	Unlimited (Box only)	Unlimited (Box only)	3/16	Unlimited	30°	Unlimited		
Production T-, Y-, or K-Connection Fillet Welds			Number of Specimens ^a				Qualified Dimensions					
Type of Test Weld	Nominal Size of Test Pipe, D	Nominal Test Thickness, in.	Fillet Weld Break	Macro- etch	Root Bend ^b	Face Bend ^b	Nominal Pipe or Tube Size Qualified, in.		Nominal Wall or Plate Thickness Qualified		Dihedral Angles Qualified ^g	
							Min	Max	Min	Max	Min	Max
5G position (Groove)	Unlimited	≥ 1/8	—	—	2 (Note c)	2 (Note c)	(Note e)	Unlimited	1/8 (Note d)	Unlimited (Note d)	30°	Unlimited
Option 1— Fillet (Fig. 4.37) ^g	—	≥ 1/2	1	1	—	—	24	Unlimited	1/8	Unlimited	60°	Unlimited
Option 2— Fillet (Fig. 4.33) ^g	—	3/8	—	—	2	—	24	Unlimited	1/8	Unlimited	60°	Unlimited
Option 3— Fillet (Fig. 4.20)	Unlimited	≥ 1/8	—	1	—	—	D	Unlimited	1/8	Unlimited	30°	Unlimited

(3) Tests on Electroslag and Electrogas Welding

Production Plate Groove Welds		Number of Specimens ^a		Nominal Plate Thickness Qualified, in.			
Type of Test Weld	Nominal Plate Thickness Tested, T, in.	Side Bend ^b (see Fig. 4.13)		Min	Max		
		Groove (Fig. 4.36)	< 1-1/2	2		1/8	T
			1-1/2	2		1/8	Unlimited

^a All welds shall be visually inspected (see 4.30.1). One test pipe, plate or tubing shall be required for each position tested, unless otherwise noted.

^b Radiographic examination of the test plate, pipe or tubing may be made in lieu of the bend tests (see 4.19.1.1).

^c For 3/8 in. plate or wall thickness, a side-bend test may be substituted for each of the required face- and root-bend tests.

^d Also qualifies for welding any fillet or PJP weld size on any thickness of plate, pipe or tubing.

^e The minimum pipe size qualified shall be 1/2 the test diameter or 4 in., whichever is greater.

^f See Table 4.10 for appropriate groove details.

^g Two plates required, each subject to the test specimen requirements described. One plate shall be welded in the 3F position and the other in the 4F position.

^h For dihedral angles < 30°, see 4.26.1.

ⁱ Two root and two face bends.

Table 4.11 (Continued)
Welder and Welding Operator Qualification—Number and Type of Specimens and Range of Thickness and Diameter Qualified (Dimensions in Millimeters) (see 4.18.2.1)

(1) Test on Plate			Number of Specimens ^a				Qualified Dimensions					
Production Groove or Plug Welds			Face Bend ^b (Fig. 4.12)	Root Bend ^b (Fig. 4.12)	Side Bend ^b (Fig. 4.13)	Macro-etch	Nominal Plate, Pipe or Tube Thickness Qualified, mm					
Type of Test Weld (Applicable Figures)	Nominal Thickness of Test Plate, T, mm	Min					Max					
Groove (Fig. 4.31 or 4.32)	10	1	1	(Note c)	—	3	20 max ^d					
Groove (Fig. 4.21, 4.22, or 4.30)	10 < T < 25	—	—	2	—	3	2T max ^d					
Groove (Fig. 4.21, 4.22, or 4.30)	25 or over	—	—	2	—	3	Unlimited ^d					
Plug (Fig. 4.38)	10	—	—	—	2	3	Unlimited					
Production Fillet Welds (T-joint and Skewed)			Number of Specimens ^a				Qualified Dimensions		Dihedral Angles Qualified ^b			
Type of Test Weld (Applicable Figures)	Nominal Test Plate Thickness, T, mm	Fillet Weld Break	Macro-etch	Side Bend ^b	Root Bend ^b	Face Bend ^b	Nominal Plate Thickness Qualified, mm		Min	Max		
							Min	Max	Min	Max		
Groove (Fig. 4.31 or 4.32)	10	—	—	(Note 3)	1	1	3	Unlimited	30°	Unlimited		
Groove (Fig. 4.31 or 4.32)	10 < T < 25	—	—	2	—	—	3	Unlimited	30°	Unlimited		
Groove (Fig. 4.21, 4.22, or 4.30)	≥ 25	—	—	2	—	—	3	Unlimited	30°	Unlimited		
Fillet Option 1 (Fig. 4.37)	12	1	1	—	—	—	3	Unlimited	60°	135°		
Fillet Option 2 (Fig. 4.33)	10	—	—	—	2	—	3	Unlimited	60°	135°		
Fillet Option 3 (Fig. 4.20) [Any diam. pipe]	> 3	—	1	—	—	—	3	Unlimited	30°	Unlimited		
(2) Tests on Pipe or Tubing ^e			Number of Specimens ^a						Nominal Pipe or Tube Size Qualified, mm		Nominal Plate, Pipe or Tube Wall Thickness ^d Qualified, mm	
Production CJP Groove Butt Joints			1G and 2G Positions Only			5G, 6G and 6GR Positions Only			Min	Max	Min	Max
Type of Test Weld	Nominal Size of Test Pipe, mm	Nominal Test Thickness, mm	Face Bend ^b	Root Bend ^b	Side Bend ^b	Face Bend ^b	Root Bend ^b	Side Bend ^b	Min	Max	Min	Max
Groove	≤ 100	Unlimited	1	1	(Note c)	2	2	(Note c)	20	100	3	20
Groove	> 100	≤ 10	1	1	(Note c)	2	2	(Note c)	(Note e)	Unlimited	3	20
Groove	> 100	> 10	—	—	2	—	—	4	(Note e)	Unlimited	5	Unlimited

(continued)

Table 4.11 (Continued)(2) Test on Pipe or Tubing^f (cont'd)

Production T-, Y-, or K-Connection CJP Groove Welds			Number of Specimens ^a		Qualified Dimensions					
					Nominal Pipe or Tube Size Qualified, mm		Nominal Wall or Plate Thickness ^d Qualified, mm		Dihedral Angles Qualified ^h	
Type of Test Weld	Nominal Size of Test Pipe, mm	Nominal Test Thickness, mm	Side Bend ^b	Macro- etch	Min	Max	Min	Max	Min	Max
Pipe Groove (Fig. 4.27)	≥ 150 O.D.	≥ 12	4	—	100	Unlimited	5	Unlimited	30°	Unlimited
<u>Pipe Groove</u> (Fig. 4.28)	< 100 O.D.	≥ 5	Note i	—	20	< 100	3	Unlimited	30°	Unlimited
Box Groove (Fig. 4.29)	Unlimited	≥ 12	4	4	Unlimited (Box only)	Unlimited (Box only)	5	Unlimited	30°	Unlimited

Production T-, Y-, or K-Connection Fillet Welds			Number of Specimens ^a				Qualified Dimensions					
Type of Test Weld	Nominal Size of Test Pipe, D	Nominal Test Thickness, mm	Fillet Weld Break	Macro- etch	Root Bend ^b	Face Bend ^b	Nominal Pipe or Tube Size Qualified, mm		Nominal Wall or Plate Thickness Qualified, mm		Dihedral Angles Qualified ^h	
							Min	Max	Min	Max	Min	Max
5G position (Groove)	Unlimited	≥ 3	—	—	2 (Note c)	2 (Note c)	(Note e)	Unlimited	3 (Note d)	Unlimited (Note d)	30°	Unlimited
Option 1— Fillet (Fig. 4.37) ^g	—	≥ 12	1	1	—	—	600	Unlimited	3	Unlimited	60°	Unlimited
Option 2— Fillet (Fig. 4.33) ^g	—	10	—	—	2	—	600	Unlimited	3	Unlimited	60°	Unlimited
Option 3— Fillet (Fig. 4.20)	Unlimited	≥ 3	—	1	—	—	D	Unlimited	3	Unlimited	30°	Unlimited

(3) Tests on Electroslag and Electrogas Welding

Production Plate Groove Welds		Number of Specimens ^a		Nominal Plate Thickness Qualified, mm	
Type of Test Weld	Nominal Plate Thickness Tested, T, mm	Side Bend ^b (see Fig. 4.13)		Min	Max
Groove (Fig. 4.36)	< 38	2		3	T
	38	2		3	Unlimited

^a All welds shall be visually inspected (see 4.30.1). One test pipe, plate or tubing shall be required for each position tested, unless otherwise noted.

^b Radiographic examination of the test plate, pipe or tubing may be made in lieu of the bend tests (see 4.19.1.1).

^c For 10 mm plate or wall thickness, a side-bend test may be substituted for each of the required face- and root-bend tests.

^d Also qualifies for welding any fillet or PJP weld size on any thickness of plate, pipe or tubing.

^e The minimum pipe size qualified shall be 1/2 the test diameter or 100 mm, whichever is greater.

^f See Table 4.10 for appropriate groove details.

^g Two plates required, each subject to the test specimen requirements described. One plate shall be welded in the 3F position and the other in the 4F position.

^h For dihedral angles < 30°, see 4.26.1.

ⁱ Two root and two face bends.