

AWS D1.2 (Structural Welding Code-Aluminum)

Quick Review on Essential Variables

1-Guide (General)

AWS D1.2, Table 3.1 A change in the mode of metal transfer for GMAW, a change from AC to DC (GTAW, GMAW) or vice versa, a change from DCEN to DCEP (GTAW) or vice versa, a change on shielding gases, M-number, etc. are change of essential variables and need re-qualification of WPS (by PQR).

2-Guide (Position)

AWS D1.2, Table 3.1 Vertical Welding: For any pass from upward to downward or vice versa is essential variable. Also change from forehand to backhand and vice versa (except as stated in Table 4.4) are essential variables.

AWS D1.2, Table 3.3 WPS Qualification

CJP and PJP Groove (Plate or Pipe), or Fillet Weld (Plate or Pipe) Qualification Test:

Position Tested	Position Qualified*
1G, 1G (Rotated)	F
2G (CJP)	F, H
2G (PJP)	H
3G (CJP)	F, V
3G (PJP)	V
4G (CJP)	F, OH
4G (PJP)	OH
5G	F, V, OH
6G	All Positions
1F, 1F (Rotated)	F
2F, 2F (Rotated)	F, H
3F	V
4F (Plate)	All Positions
4F (Tubular)	F, H, OH
5F	All Positions

* Test on plate qualifies for welding pipe or tubing over 24 in (610 mm) in diameter.

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3-Guide (Thickness/Diameter of Base Metal Range)

AWS D1.2, Table 3.4:

Test on Plate, CJP Groove Welds:

T: Thickness of Test Coupon Welded

T less than 1/8 in. (3 mm):

Qualified Thickness Range: T Min., 2T Max.

T from 1/8 in. (3 mm), to 3/8 in. (10 mm), incl.:

Qualified Thickness Range: 1/8 in. (3 mm) Min., 2T Max.

T over 3/8 in. (10 mm), to less than 1 in. (25 mm):

Qualified Thickness Range: 0.5T Min., 2T Max.

T 1 in. (25 mm) and over:

Qualified Thickness Range: 0.5T Min., Unlimited

AWS D1.2, Table 3.5:

Test on Plate, PJP Groove Welds:

S: Thickness of Test Groove Depth

Groove type same as construction,

Groove Depth Max. 1 in. (25 mm):

Qualified Thickness Range: Unlimited

Fillet Weld WPS Qualification (Qualify all Plate/Pipe

Thickness): Test shall be based on Max. single pass and Min.

multiple pass fillet weld size to be used in construction

(See AWS D1.2, Table 3.6).

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4-Guide (Diameter of Base Metal Range)

AWS D1.2, Table 3.4

Test on Pipe (Tube), CJP Groove Welds:
Tests on Cyclically Loaded Tubular Structures:

A) Job Size Test Pipes:

A.1) Nominal Diam. Less than 24 in. (610 mm):

T less than 1/8 in. (3 mm):

Qualified Thickness Range: T **Min.**, 2T **Max.**

T from 1/8 in. (3 mm) to 3/8 in. (10 mm), incl.:

Qualified Thickness Range: 1/8 in. (3 mm) **Min.**, 2T **Max.**

T over 3/8 in. (10 mm), but less than 3/4 in. (19 mm):

Qualified Thickness Range: T/2 **Min.**, 2T **Max.**

T from 3/4 in. (19 mm) and over:

Qualified Thickness Range: T/2 **Min.**, 2T **Max.**

Qualified Nominal Diameter of Pipe (Tube) Size:
Test diameter and over

A.2) Nominal Diam. from 24 in. (610 mm) and over

B) Standard Test Pipes

Test on Pipe (Tube), CJP Groove Welds
Tests on Cyclically Loaded Tubular Structures

(See results for **A.2)** and **B)** on the next page):

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4-Guide (Diameter of Base Metal Range)

AWS D1.2, Table 3.4

Test on Pipe (Tube), CJP Groove Welds:

Tests on Cyclically Loaded Tubular Structures:

A.2) Nominal Diam. from 24 in. (610 mm) and over:

T from 1/8 in. (3 mm) to 3/8 in. (10 mm), incl.:

Qualified Thickness Range: 1/8 in. (3 mm) **Min.**, 2T **Max.**

Qualified Nominal Diameter of Pipe (Tube) Size:

Test diameter and over

T over 3/8 in. (10 mm), but less than 3/4 in. (19 mm):

Qualified Thickness Range: T/2 **Min.**, 2T **Max.**

Qualified Nominal Diameter of Pipe (Tube) Size:

24 in. (610 mm OD) and over

T from 3/4 in. (19 mm) and over:

Qualified Thickness Range: 3/8 in. (10 mm) **Min.**, **Unlimited**

Qualified Nominal Diameter of Pipe (Tube) Size:

24 in. (610 mm OD) and over

B) Standard Test Pipes:

2 in. Sch. 80 or 3 in. Sch. 40

Qualified Thickness Range:

1/8 in. (3 mm) **Min.**, 1/2 in. (13 mm) **Max.**

Qualified Nominal Diameter of Pipe (Tube) Size:

3/4 in. (19 mm OD) through 4 in. (100 mm OD)

6 in. Sch. 120 or 8 in. Sch. 80

Qualified Thickness Range: 3/8 in. (10 mm) **Min.**, **Unlimited**

Qualified Nominal Diameter of Pipe (Tube) Size:

4 in. (100 mm OD) and over

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4-Guide (Diameter of Base Metal Range)

AWS D1.2, Table 3.4

Test on Pipe (Tube), CJP Groove Welds:

Tests on Statically Loaded Tubular Structures:

C.1) Wrought material type

[6 thru 8 in. OD; T from 1/8 (3 mm) to 3/8 in. (10 mm) incl.]

Qualified Thickness Range:

1/8 in. (3 mm) **Min.**, 2T **Max.**

Qualified Nominal Diameter of Pipe (Tube) Size:

3/4 in. (19 mm) **Min.**, 16 in. (410 mm OD) **Max.**

C.2) Cast to Wrought or Cast to Cast material type

[3 thru 5 in. OD with T=3/16 in (5 mm)]

Qualified Thickness Range:

1/8 in. (3 mm) **Min.**, 1/2 in. (13 mm) **Max.**

Qualified Nominal Diameter of Pipe (Tube) Size:

2 in. (50 mm) **Min.**, 16 in. (410 mm OD) **Max.**

5-Guide (Base Metal Selection)

AWS D1.2, Table 3.1 A change from one M-number group to another M-number group or to an alloy that does not have M-number is essential variables.

6-Guide (Filler Metal Selection)

AWS D1.2, Table 3.1 A change from one F-number group to another F-number group or to an alloy that does not have F-number is essential variables.

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Quick Review on Essential Variables

7-Guide (Joint)

AWS D1.2, Table 3.1: Essential Variables for Joints:

- A change in groove type (e.g., single-V to double-V), **except** qualification of any CJP groove weld qualifies for any groove detail as shown in **Annex B1** **except** square groove joints
- A change in type of groove to a square groove
- A decrease of more than 5 degrees in the nominal groove angle
- The omission, but not inclusion, of backgouging
- A change from permanent backing to temporary backing or no backing