



AWS Amendment Notice

The following Amendments have been made and incorporated into the current edition of this document.

2nd Printing:

AWS Standard: D1.5M/D1.5: 2015-AMD1

Amendment Number: 1

Subject: List of Tables

12.3 M 270M (A709M) Gr. 250, 345, 345S Minimum Preheat and Interpass Temperatures, °C

12.4 M 270 (A709) Gr. 36, 50, 50S Minimum Preheat and Interpass Temperatures, °F

12.5 M 270M (A709M) Gr. 345W, HPS 485W Minimum Preheat and Interpass Temperatures, °C

12.6 M 270 (A709) Gr. 50W, HPS 50W, HPS 70W Minimum Preheat and Interpass Temperatures, °F

12.7 M 270M/M 270 (A709/A709M) Grade HPS 690W [HPS 100W] Minimum and Maximum Preheat/Interpass Temperatures, °C [°F]

AWS Standard: D1.5M/D1.5: 2015-AMD1

Amendment Number: 1

Subject: Clause 4.3

4.3 Heat Input Control for Grade HPS 690W [HPS 100W] Steel

When M 270M/M 270 Grade HPS 690W [HPS 100W] (A709/A709M Grade HPS 100W [HPS 690W]) steels are welded, welding heat input shall be appropriate for the thickness of steel to be joined and the preheat and interpass temperature used. Heat input shall not exceed the manufacturers' recommendations. Table 12.7 may be used for guidance in welding M 270M/M 270 (A709/A709M) Grade HPS 690W [HPS 100W] steel.

AWS Standard: D1.5M/D1.5: 2015-AMD1

Amendment Number: 1

Subject: Clause 4.5.2.1

4.5.2.1 Approved Atmospheric Exposure Periods.

Electrodes exposed to the atmosphere upon removal from drying or holding ovens or hermetically sealed containers shall be used within the time limit shown in Table 4.6 or redried at 230°C to 290°C [450°F to 550°F] for two hours minimum.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause 4.5.2.2

4.5.2.2 Short Exposure Times. Electrodes exposed to the atmosphere for periods less than those allowed by Table 4.6 may be returned to a holding oven maintained at 120°C [250°F] minimum and after a minimum period of four hours at that temperature may be reissued.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause 4.5.2.3

4.5.2.3 Optional Supplemental Moisture-Resistant Designators. E70XX-X, E80XX-X, E90XX-X, E100XX-X, and E110XX-X electrodes with the AWS filler metal specifications optional supplemental moisture resistance designator “R” may be exposed to the atmosphere for up to nine hours. Moisture-resistant electrodes shall be received in containers that bear the additional designator “R” as part of the AWS classification.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause C-4.5.2.3

C-4.5.2.3 Optional Supplement Moisture-Resistant Designators. In order for a low-hydrogen electrode to be designated as low-moisture-absorbing with the “R” suffix designator, electrodes are tested by exposure to 27°C [80°F] and 80% relative humidity for a period of not less than nine hours. These tests are defined in AWS A5.1/A5.1M and AWS A5.5/A5.5M, and are typically conducted by the electrode manufacturer. The nine-hour time period was selected based on a typical workshift length, including mealtime. The moisture content of the exposed covering must not exceed the maximum specified moisture content for the “R” designated electrode and classification in the appropriate AWS A5.1/A5.1M or AWS A5.5/A5.5M specification. R-designated E70XX-X, E80XX-X, E90XX-X, E100XX-X, and E110XX-X electrodes may be used with exposure times of up to nine hours. For other electrodes, exposure time is limited to that permitted in Table 4.6.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Table 4.3

Table 4.3
Minimum Preheat and Interpass Temperature, °C [°F]

Welding Process (Base Metal)	Thickness of Thickest Part at Point of Welding, mm [in]			
	To 20 mm [3/4 in] Incl.	Over 20 mm [3/4 in] to 40 [1-1/2 in] Incl.	Over 40 mm [1-1/2 in] to 65 mm [2-1/2 in] Incl.	Over 65 mm [2-1/2 in]
SAW; GMAW; FCAW; SMAW (M 270M/M 270 (A709/A709M) Gr. 250 [36], 345 [50], 345S [50S], 345W [50W], HPS 345W [HPS 50W])	10 [50]	20 [70]	65 [150]	110 [225]
SAW; GMAW; FCAW; SMAW (M 270M/M 270 (A709/A709M) Gr. HPS 485W [HPS 70W] and HPS 690W [HPS 100W]) ^a	10 [50]	50 [125]	80 [175]	110 [225]

^a See 4.2.2 for maximum preheat and interpass temperature limitations.

Note: See Annex G and Tables 12.3, 12.4, 12.5, 12.6 and 12.7 for alternate preheat and interpass temperatures.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Table 4.6

AWS Filler Metal Specification	Electrode	Hours ^a
A5.1	E70XX	4 max.
A5.5	E70XX-X	4 max.
	E80XX-X	2 max.
	E90XX-X	1 max.
	E100XX-X	1/2 max.
	E110XX-X	1/2 max.

^a See 4.5.2.3.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause 5.4.3.3(2)(a)

5.4.3.3(2)(a)

(a) When quenched and tempered steels are to be welded, both the minimum and maximum preheat and interpass temperatures shall be listed for each welding heat input and thickness as shown in Table 12.7.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause 5.21

Part B—Welder, Welding Operator, and Tack Welder Qualification

5.21 General Requirements

Welders, welding operators, and tack welders using SMAW, SAW, GMAW, FCAW, ESW, and EGW welding processes shall be qualified by the tests described in Part B.

Vision acuity is important and necessary for welders, welding operators, and tack welders to perform their jobs in an acceptable manner. Testing is not a guarantee that their vision will continue to remain acceptable. If it appears that an individual is having difficulty seeing properly, a vision acuity test should be performed.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause 12.7.3

12.7.3 Fillet WPS Qualification. Except as provided in 12.7.1, fillet WPSs shall be qualified by testing in conformance with Clause 5.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause 12.14

12.14 Preheat and Interpass Temperature Control

Preheat and interpass temperature control shall be as specified in 4.2. The minimum preheat and interpass temperature for AASHTO M 270M/M 270 (ASTM A709/A709M) Grade 250 [36], 345 [50], 345S [50S], 345W [50W], HPS 345W [HPS 50W], and Grade HPS 485W [HPS 70W] steels shall be as described in Tables 12.3, 12.4, 12.5 and 12.6. The minimum and maximum preheat temperatures for M 270M/M 270 (A709/A709M) Grade HPS 690W [HPS 100W] steel shall be as described in Table 12.7. For Grade HPS 485W [HPS 70W], the maximum preheat and interpass temperature shall be 230°C [450°F] for all thicknesses.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause C-12.14

C-12.14 Preheat and Interpass Temperature Control

Tables 12.3, 12.4, 12.5, 12.6, and 12.7 for preheat under the Fracture Control Plan have added two additional elements not considered for redundant members: the diffusible hydrogen limit of the weld metal deposited by various filler metals, and the heat input from welding. The level of required preheat is therefore a function of the type of steel, thickness of steel, hydrogen level of the filler metal, and the heat input from the welding process.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause C-12.14 (11th paragraph)

C-12.14 Preheat and Interpass Temperature Control

For AASHTO M 270M/M 270 (ASTM A709/A709M) Grade HPS 690W [HPS 100W] steel, it was determined that the highest level of diffusible hydrogen allowed should be limited to H8. For this reason, Table 12.7 does not include the H16 category, and H4 and H8 have been combined into one column.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Clause 12.17.6

12.17.6(8)(b)

(b) Grade HPS 690W [HPS 100W] steel shall have a preheat and interpass temperature that conforms to the requirements of Table 12.7 for the heat input used, except that the minimum temperature shall be 110°C [225°F]. Care shall be taken when welding Grade HPS 690W [HPS 100W] steel to ensure that the combined preheat or interpass temperature plus welding heat input does not exceed the manufacturer's recommendations.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Index

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AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Table 12.2

Table 12.2
Tack Weld Requirements (see 12.13.1.2)

Type	WPS Required?	Minimum Size	Minimum Length	Minimum Preheat	Notes
Remelted by SAW	No	None	None	None	a, b
Covered by non-SAW	Yes	Table 2.1 or 2.2	75 mm [3 in]	Table 12.3, 12.4, 12.5, 12.6 or 12.7	
Tack welds outside joint	Yes	Table 2.1 or 2.2	75 mm [3 in]	Table 12.3, 12.4, 12.5, 12.6, or 12.7	c
Tack welds <75 mm [3 in] long, or smaller than Table 2.1 or 2.2	Yes	None	None	200°C [400°F]	

- ^a GMAW may be used for tack welding without the Engineer's approval.
- ^b SMAW electrodes shall meet the requirements of 12.6.2.
- ^c Tack welds outside the joint shall require the Engineer's approval (see 12.13.1.1).

Note: Filler metals listed in Table 4.1 shall be used.

AWS Standard: D1.5M/D1.5: 2015-AMD1
Amendment Number: 1
Subject: Tables 12.3-12.7

Table 12.3
M270M (A709M) Gr. 250, 345 [50], 345S
Minimum Preheat and Interpass Temperatures, °C (see 12.14)

Thickness t, mm	Heat Input (as calculated by 5.12) kJ/mm [kJ/mm]								
	1.2 < HI ≤ 2.0			2.0 < HI ≤ 2.8			HI > 2.8		
	H4	H8	H16	H4	H8	H16	H4	H8	H16
t ≤ 20	40	50	70	40	40	50	40	40	40
20 < t ≤ 40	70	80	100	50	70	80	40	50	70
40 < t ≤ 60	90	110	120	80	90	110	70	80	90
t > 60	150	160	180	140	150	160	120	140	150

Table 12.4
M270 (A709) Gr. 36, 50, 50S
Minimum Preheat and Interpass Temperatures, °F (see 12.14)

Thickness t, in	Heat Input (as calculated by 5.12) kJ/in								
	30 < HI ≤ 50			50 < HI ≤ 70			HI > 70		
	H4	H8	H16	H4	H8	H16	H4	H8	H16
t ≤ 3/4	100	125	150	100	100	125	100	100	100
3/4 < t ≤ 1-1/2	150	175	200	125	150	175	100	125	150
1-1/2 < t ≤ 2-1/2	200	225	250	175	200	225	150	175	200
t > 2-1/2	300	325	350	275	300	325	250	275	300

Table 12.5
M270M (A709M) Gr. 345W, HPS 345W, HPS 485W
Minimum Preheat and Interpass Temperatures, °C (see 12.14)

Thickness t, mm [in]	Heat Input (as calculated by 5.12) kJ/mm								
	1.2 < HI ≤ 2.0			2.0 < HI ≤ 2.8			HI > 2.8		
	H4	H8	H16	H4	H8	H16	H4	H8	H16
t ≤ 20	40	50	70	40	40	50	40	40	40
20 < t ≤ 40	90	110	120	80	90	110	70	80	90
40 < t ≤ 60	150	160	180	140	150	160	120	140	150
t > 60	180	190	200	160	180	190	150	160	180

Table 12.6
M270 (A709) Gr. 50W, HPS 50W, HPS 70W
Minimum Preheat and Interpass Temperatures, °F (see 12.14)

Thickness t, mm-in	Heat Input (as calculated by 5.12) kJ/in								
	30 < HI ≤ 50			50 < HI ≤ 70			HI > 70		
	H4	H8	H16	H4	H8	H16	H4	H8	H16
t ≤ 3/4	100	125	150	100	100	125	100	100	100
3/4 < t ≤ 1-1/2	200	225	250	175	200	225	150	175	200
1-1/2 < t ≤ 2-1/2	300	325	350	275	300	325	250	275	300
t > 2-1/2	350	375	400	325	350	375	300	325	350

Table 12.7
M 270M/M 270 (A709/A709M) Grade HPS 690W [HPS 100W] Minimum and Maximum Preheat/Interpass Temperature, °C [°F] (see 12.14)

Thickness t, mm [in]	Heat Input (as calculated by 5.12) kJ/mm [kJ/in]				
	1.2 [30] ≤ HI	1.6 [40] ≤ HI	2.0 [50] ≤ HI	2.8 [70] ≤ HI	3.6 [90] ≤ HI
	< 1.6 [40]	< 2.0 [50]	< 2.8 [70]	< 3.6 [90]	
6 [1/4] ≤ t ≤ 10 [3/8]	40-60 [100-150]	—	—	—	—
10 [3/8] < t ≤ 13 [1/2]	60-160 [150-300]	40-100 [100-200]	—	—	—
13 [1/2] < t ≤ 20 [3/4]	120-200 [250-400]	100-180 [200-350]	40-120 [100-250]	—	—
20 [3/4] < t ≤ 25 [1]	—	120-200 [250-400]	120-200 [250-400]	60-160 [150-300]	—
25 [1] < t ≤ 50 [2]	—	—	120-200 [250-400]	120-200 [250-400]	100-180 [200-350]
t > 50 [2]	—	—	150-240 [300-450]	140-240 [300-450]	140-240 [300-450]

Note: The table applies to electrodes with the H4 or H8 optional supplemental designator for diffusible hydrogen limits.

AWS Standard: D1.5M/D1.5: 2015-AMD1

Amendment Number: 1

Subject: Clause K10.2

K10.2 Acceptance Criteria. Welds shall be acceptable provided they have no cracks, nor any indications that amplitude or length exceed that specified in Table K.3 for the applicable type of loading. Discontinuities shall be classified based on their maximum amplitude in accordance with Table K.1 (also see Figure K.4):