



ASME WELD NUMBER TABLES
P NUMBER BASE & F NUMBER FILLER

TABLE OF CONTENTS

Hustling again to find ASME Weld Number tables and get your project done? How often have you wished somebody would do something to make this easier? We have!

Jump directly to the table you need or better yet, learn how [ProWrite Welding Software](#) makes this job easier.

P Number (Base Metal- Procedure/Welder Tables QW-423/ QW-424)

S Number, (Base Metal – no table)

Group Number, (Base Metal Groupings – Table QW-420)

Group Number, (Qualification Base Metal Groupings – Table QW/QB-422)

F Number, (Filler Metal – Table QW 423)

A Number (Filler Metal – Table QW-442)

The purpose of the ASME Weld Number tables is to support a numbering system methodology that helps to make welding procedure creation and welding procedure management much easier as well as more affordable.

These numbers¹ have been assigned to base metals and filler metals alike, grouping materials to reduce the number of welding procedures and welder performance qualification tests needed to qualify a wide range of materials (base metals and filler metals). The base metal grouping scheme consists of the P numbers and Group Numbers. It also included the S Numbers until they were removed from the ASME code in 2009. The filler metal grouping scheme consists of the F numbers and A Numbers.

Note¹: these number tables and the information contained were accurate at the time of blog post first publish date in September 2015, to ensure compliance with the current code we recommend referring to latest code book edition or the latest version of welding procedure management and code assistance software ProWrite.

BASE METALS: THE P NUMBER

This number is used to group similar Base Metals, allowing qualification of an entire selection versus qualification of just one. These base metals are grouped by material and assigned P Numbers based on what material they are. For example, the P Number 1 is assigned to Carbon Manganese or Low Carbon Steel base metals.

THE 12 SECTIONS OF THE ASME BPV CODE

P Number	Base Metal
1	Carbon Manganese Steels (four Group Numbers)
2	Not Used
3	1/2 Molybdenum or 1/2 Chromium, 1/2 Molybdenum (three Group Numbers)
4	1 1/4 Chromium, 1/2 Molybdenum (two Group Numbers)
5A	2 1/4 Chromium, 1 Molybdenum
5B	5 Chromium, 1/2 Molybdenum or 9 Chromium, 1 Molybdenum (two Group Numbers)
5C	Chromium, Molybdenum, Vanadium (five Group Numbers)
6	Martensitic Stainless Steels (Grade 410, 415, 429) (six Group Numbers)
7	Ferritic Stainless Steels (Grade 409, 430)
8	Austenitic Stainless Steels: Group 1 - Grades 304, 316, 317, 347 Group 2 - Grades 309, 310 Group 3 - High Manganese Grades Group 4 - High Molybdenum Grades
9A, B, C	2 - 4 Nickel Steels
10A, B, C, F	Various Low Alloy Steels
10H	Duplex and Super Duplex Stainless Steel (Grades 31803, 32750)
10I	High Chromium Stainless Steel
10J	High Chromium, Molybdenum Stainless Steel
10K	High Chromium, Molybdenum, Nickel Stainless Steel
11A	Various High Strength Low Alloy Steels (six Group Numbers)

P Number	Base Metal
11B	Various High Strength Low Alloy Steels (ten Group Numbers)
15E	9 Chromium, 1 Molybdenum
16 to 20	Not Used
21	High Aluminum Content (1000 and 3000 series)
22	Aluminum (5000 series - 5052, 5454)
23	Aluminum (6000 series - 6061, 6063)
24	Not Used
25	Aluminum (5000 series - 5083, 5086, 5456)
26 to 30	Not Used
31	High Copper Content
32	Brass
33	Copper Silicon
34	Copper Nickel
35	Copper Aluminum
36 to 40	Not Used
41	High Nickel Content
42	Nickel, Copper - (Monel 500)
43	Nickel, Chromium, Iron - (Inconel) (C22, C276, X)
44	Nickel, Molybdenum - (Hastelloy B2)
45	Nickel, Chromium, Si
46	Nickel, Chromium, Silicone
47	Nickel, Chromium, Tungsten
48 to 50	Not Used
51, 52, 53	Titanium Alloys
61, 62	Zirconium Alloys

Because of these assignments, the cost of the continuous procedure and performance qualification testing does not exist. In most cases, qualifying a welder on a specific material will also qualify that welder on a variety of related materials.

“For example, a welder who qualifies on a P1 to the P1 material is also qualified to weld P-1 through P-15F, P-34, and any P-40s.”

ASME Section IX’s Number Table from QW-423 Welder Qualifications is shown as follows;

Base Metals for Welder Qualification	Qualified Production Base Metals
P - No. 1 through P - No. 15F, P - No. 34, or P - No. 41 through P - No. 49	P - No. 1 through P - No. 15F, P - No. 34, and P - No. 41 through P - No. 49
P - No. 21 through P - No. 26	P - No. 21 through P - No. 26
P - No. 51 through P - No. 53 or P - No. 61 or P - No. 62	P - No. 51 through P - No. 53 and P - No. 61 and P - No. 62

In some cases, qualifying a production coupon for procedure specification also qualifies that procedure to a wider range of materials.

ASME Section IX’s Number Table from QW-424 Procedure Qualifications is shown as follows;

Base Metal(s) Used for Production Qualification Coupon	Base Metals Qualified
One metal from a P - Number to any metal from the same P - Number	Any metals assigned that P - Number
One metal from P - No. 15E to any metal from P-No. 15E	Any P - No. 15E or 5B metal to any metal assigned P -No. 15E or 5B
One metal from a P - Number to any metal from any other P - Number	Any metal assigned the first P - Number to any metal assigned the second P - Number
One metal from P - No. 15E to any metal from any other P - Number	Any P - No. 15E or 5B metal to any metal assigned the second P - Number
One metal from P - No. 3 to any metal from P - No. 3	Any P - No. 3 metal to any metal assigned P - No. 3 or 1
One metal from P - No. 4 to any metal from P - No. 4	Any P - No. 4 metal to any metal assigned P - No. 4, 3, or 1
One metal from P - No. 5A to any metal from P - No. 5A	Any P - No. 5A metal to any metal assigned P - No. 5A, 4, 3, or 1
One metal from P - No. 5A to any metal from P - No. 4, P - No. 3, or P - No. 1	Any P - No. 5A metal to any metal assigned to P - No. 4, 3, or 1
One metal from P - No. 4 to any metal from P - No. 3, or P - No. 1	Any P - No. 4 metal to any metal assigned P - No. 3 or 1
Any unassigned metal to the same unassigned metal	The unassigned metal to itself
Any unassigned metal to any P - Number metal	The unassigned metal to any metal assigned to the same P - Number as the qualified metal
Any unassigned metal to any metal from P - No. 15E	The unassigned metal to any metal assigned P - No. 15E or 5B
Any unassigned metal to any other unassigned metal	The first unassigned metal to the second unassigned metal

THE S NUMBER

The S Number was removed from ASME Section IX in 2009. The S Number's purpose was identical to the P Number. However, these numbers were assigned to those materials included for pipework to the ASME B31 Code for Pressure Piping. These materials were also covered by the P-Number, but not the converse.

THE GROUP NUMBER

This number is used only for impact testing requirements of ferrous metals, subgrouping the P-Number materials by the similarity of metallurgical properties (see above P-Number table). However, per ASME Section IX, "These assignments are based essentially on comparable base metal characteristics, such as composition, weldability, brazeability, and mechanical properties, where this can logically be done. These assignments do not imply that base metals may be indiscriminately substituted for a base metal that was used in the qualification test without consideration of compatibility from the standpoint of metallurgical properties, post weld heat treatment, design, mechanical properties, and service requirements." These groupings can be found in Table QW/QB-422.

The following table is a replica of ASME Section IX's Number Table QW-420 that shows the assignment groups for various alloy systems:

Base Metal	Welding	Brazing
Steel and Steel alloys	P - No. 1 through P - No. 15F	P - No. 101 through P - No. 103
Aluminum and aluminum - base alloys	P - No. 21 through P - No. 26	P - No. 104 and P - No. 105
Copper and copper - base alloys	P - No. 31 through P - No. 35	P - No. 107 and P - No. 108
Nickel and nickel - base alloys	P - No. 41 through P - No. 49	P - No. 110 through P - No. 112
Titanium and titanium - base alloys	P - No. 51 through P - No. 53	P - No. 115
Zirconium and zirconium - base alloys	P - No. 61 and P - No. 62	P - No. 117

FILLER METALS: THE F NUMBER

This number is used to group filler metals used in welding procedures and welder performance qualifications. The definition of F-Numbers is provided in QW-431 of ASME IX:

"The grouping of electrodes and welding rods in Table QW-432 is based essentially on their usability characteristics, which fundamentally determine the ability of welders to make satisfactory welds with a given filler metal. This grouping is made to reduce the number of welding procedure and performance qualifications, where this can logically be done. The grouping does not imply that base metals or filler metals within a group may be indiscriminately substituted for a metal that was used in the qualification test without consideration of the compatibility of the base and filler metals from the standpoint of metallurgical properties, post weld heat treatment design and service requirements, and mechanical properties".

F-Numbers of filler metals can be found in ASME Section IX's Number Table QW-432 an extract is shown as following:

F - Numbers	Electrodes/Welding Rods
F - No. 1 through F - No. 6	Steel and Steel Alloys
F - No. 21 through F - No. 25	Aluminum and aluminum - base alloys
F - No. 31 through F - No. 37	Copper and Copper Alloys
F - No. 41 through F - No. 46	Nickel and Nickel Alloys
F - No. 51 through F - No. 56	Titanium and Titanium Alloys
F - No. 61	Zirconium and zirconium - base alloys
F - No. 71 through F - No. 72	Hard - Facing Weld Metal Overlay

ASME Section IX's Number Table QW-433 Alternate F-Numbers for welder performance qualification

Qualified With	Qualified For
Any F - No. 6	All F - No. 6 [Note (1)]
Any F - No. 21 through F - No. 25	All F - No. 21 through F - No. 25
Any F - No. 31, F - No. 32, F - No. 33, F - No. 35, F - No. 36, or F - No. 37	Only the same F - Number as was used during the qualification test
F - No. 34 or any F - No. 41 through F - No. 46	F - No. 34 and all F - No. 41 through F - No. 46
Any F - No. 51 through F - No. 55	All F - No. 51 through F - No. 55
Any F - No. 61	All F - No. 61
Any F - No. 71 through F - No. 72	Only the same F - Number as was used during the qualification test

NOTE:

(1) Deposited weld metal made using a bare rod not covered by an SFA Specification but which conforms to an analysis listed in QW - 442 shall be considered to be classified as F - No. 6.

Qualified with	F - No.1	F - No.1	F - No.2	F - No.2	F - No.3	F - No.3	F - No.4	F - No.4	F - No.5	F - No.5
Qualified For	With Backing	Without Backing	With Backing	Without Backing	With Backing	Without Backing	With Backing	Without Backing	With Backing	Without Backing
F - No.1 With Backing	X	X	X	X	X	X	X	X	X	X
F - No.1 Without Backing		X								
F - No.2 With Backing			X	X	X	X	X	X		
F - No.2 Without Backing				X						
F - No.3 With Backing					X	X	X	X		
F - No.3 Without Backing						X				
F - No.4 With Backing							X	X		
F - No.4 Without Backing								X		
F - No.5 With Backing									X	X
F - No.5 Without Backing										X

THE A NUMBER

The A-Number is a calculated value based on a combination of the chemical composition of the weld filler metal (which may be found in ASME Section II Part C), and ASME Section IX's A-Number Table QW-442:

Table QW - 442							
A Numbers Classification of Ferrous Weld Metal Analysis for Procedure Qualification							
Analysis, % [Note (1)] and [Note (2)]							
A-No.	Type of Weld Deposit	C	Cr	Mo	Ni	Mn	Si
1	Mild Steel	0.20	0.20	0.30	0.50	1.60	1.00
2	Carbon - Molybdenum	0.15	0.50	0.40-0.65	0.50	1.60	1.00
3	Chrome (0.4% to 2%) - Molybdenum	0.15	0.40-2.00	0.40-0.65	0.50	1.60	1.00
4	Chrome (2% to 4%) - Molybdenum	0.15	2.00-4.00	0.40-1.50	0.50	1.60	2.00
5	Chrome (4% to 10.5%) - Molybdenum	0.15	4.00-10.50	0.40-1.50	0.80	1.20	2.00
6	Chrome - Martensitic	0.15	11.00-15.00	0.70	0.80	2.00	1.00
7	Chrome - Ferritic	0.15	11.00-30.00	1.00	0.80	1.00	3.00
8	Chromium - Nickel	0.15	14.50-30.00	4.00	7.50-15.00	2.50	1.00
9	Chromium - Nickel	0.30	19.00-30.00	6.00	15.00-37.00	2.50	1.00
10	Nickel to 4%	0.15	0.5	0.55	0.80-4.00	1.70	1.00
11	Manganese - Molybdenum	0.17	0.5	0.25-0.75	0.85	1.25-2.25	1.00
12	Nickel - Chrome - Molybdenum	0.15	1.50	0.25-0.80	1.25-2.80	0.75-2.25	1.00

NOTES:

(1) Single values shown above are maximum.

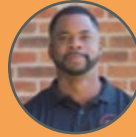
(2) Only listed elements are used to determine A - numbers.

The A-Number is an essential variable for welding procedure specifications for multiple welding processes. It identifies related filler metals based on their chemical composition and allows procedure qualifications for the whole host of related materials.

THE NUMBERS SYSTEM

The purpose of the number system is to help. It alleviates extra time and cost by qualifying welders and procedures to a host of materials by simply qualifying to one.

If you would like to learn more about how ProWrite uses this weld numbering system to assist welding procedure management and welder qualification management watch our recorded webinar [5 SOFTWARE STRATEGIES TO INCREASE WELDING PROCESS EFFICIENCY](#). It covers specific areas that provide cost-effective increases in welding process efficiency and details how we ensure the uniform application of generally accepted safe welding practices in the manufacture and fabrication of boilers & pressure vessels.



Written by Antonio Howard

With his education in applied mathematics, engineering, and computer science, Antonio is a valuable part of the CEI team, ensuring that ASME and AWS code changes are reflected in the ProWrite platform. As an AWS Certified Associate Welding Inspector, he has the perfect insight to understand the day to day needs of users in the Fabrication shop.



THINKCEI.COM