

Range Qualified Column on Welder Qualification Record – What Does It Mean?

“Charlie is qualified to WPS 1-12-1.” That is the most misleading statement in the welding industry. Charlie may have followed WPS 1-12-1 (a WPS for welding on carbon steel SMAW) when he tested, but Charlie is also qualified to weld using SMAW on Cr-Mo steels, high-strength low alloy steels, steels alloyed with nickel and even Grade 91! Welders are not qualified to follow a WPS – they are *qualified to use a welding process*.

To illustrate, a welder may follow WPS 1-32-1 which is GTAW followed by SMAW (i.e., Tig/Stick). However, when he welds the coupon, he could weld the coupon following only the GTAW portion of the WPS. That welder is obviously only qualified to weld using GTAW even though the WPS he followed allowed him to use both GTAW and SMAW!

What welders are allowed to weld in production (i.e., process, base metal, the thickness of weld deposit, position, diameter, etc.) depends entirely on the test conditions (i.e., process, base metal, the thickness of weld deposit, position, diameter, etc.) that were used when the welder tested, not on the WPS that he followed.

The Range Qualified Column

So how do you determine what a welder is qualified to do? That’s easy. The column “Range Qualified” on any NCPWB-issued welder qualification record completely describes what a welder is qualified to do. The hard part is interpreting what the information in that column means. The following explains that.

The first line is **Welding Process**. If the line says SMAW, the welder is qualified to use SMAW. If it says GTAW, the welder is qualified to use GTAW. If it says GTAW/SMAW, he is qualified to use both. When more than one process is shown, variables in other lines will also be separated by a slash, and data on each side of the slash should be considered as applying to the respective process shown on the **Welding Process** line. That is, if the processes are GTAW/SMAW and the line **Backing** says “Optional/Required,” backing is optional for GTAW and is required for SMAW.

The line **Type of Welding** will show “manual,” “semi-automatic,” “machine,” or “automatic” or some combination of these. The welder may only use the “Type” of welding permitted. This line is normally not a concern because the “type” of welding for which welders are qualified is the only type available. That is, a welder qualified to use SMAW is always qualified to use SMAW manual because manual welding is the only type of

SMAW there is. GTAW, on the other hand, can be manual and also semi-automatic (e.g. TipTig)

The line **Base Metals** identifies the base metals on which the welder may weld by showing a range of “P-numbers”. The range listed means that the welder is qualified to weld on all the materials listed, to themselves and to each other in all combinations. A partial list of P-number assignments may be found in the General Welding Guidelines, at www.pnumbers.com and in ASME Section IX, QW/QB-422.

The most common range of base metals qualified is “P-1 through 15F.” This means that the welder may weld on all base metals from P-number 1 through P-number 15F including all combinations such as P-1 to P-8. This range includes all carbon, low alloy and stainless steels.

The line **Plate, Pipe (enter diameter if pipe or tube)** gives the minimum outside diameter that the welder may weld on when making groove welds. The welder may also make groove welds on plate. Unless otherwise noted, the welder may make socket and fillet welds of any size on any diameter pipe.

When “2-7/8” OD and over” recorded on this line, that means that the welder may weld on pipe respectively 2-7/8 inches OD. When “1 in. OD and over” is recorded, that means that the welder may weld on pipe 1 inch OD and over. All pipe sizes that are larger than those shown may be welded, including pipe of infinite diameter (i.e., plate).

The line **Backing** indicates that backing is either “Required” or “Optional.” Backing is any material that is located at the root of a weld that supports liquid weld metal; this includes a backing ring or strip, a root weld made using another process (e.g., GTAW) or electrode type (e.g., E6010) and any weld made from two sides. All partial penetration welds and fillet welds are considered welding on backing. When backing is “Required,” the welder may not weld without it. When backing is “Optional,” the welder may weld with backing or without it, i.e. the welder may weld “open root.”

The lines **Filler Metal (SFA) Specification** and **Filler Metal or Electrode Classification** are for information only and do not affect what a welder is qualified to do.

The line **Filler Metal or Electrode F-Number(s)** gives the F-number welding electrodes or filler metals that the welder may use. Electrodes and filler metals are assigned F-numbers in Table QW-432 of ASME Section IX. Some of the common F-number assignments are:

<u>F-number</u>	<u>Electrode or filler metal classification</u>
F-3	E6010, E6011, E7010-A1
F-4	E7018, E7018-1, E8018-XX, E9018-XX (all low-hydrogen electrodes)

F-5	E308-16, E308L-16, E309-16, E316-16 (all E3XXX-15 or –16 electrodes)
F-6	ER70S-2, -3 and –6, ER80S-B2, ER90S-B3, ER308, ER308L, ER309, ER316L (all carbon, low alloy and stainless steel bare wires)
F-21 through F-25	All aluminum wires
F-31 through F-37	Copper and Copper alloys
F-41 through F-45	Nickel and nickel alloys
F-51 through F-53	Titanium and titanium alloys
F-61	Zirconium and Zirconium alloys

When this line indicates “None,” it means that the welder may weld without the addition of filler metal, such as is done when welding schedule 10 stainless steel pipe. That welder may not weld with the addition of filler metal unless he has a separate qualification where he passed another test in which he added used filler metal for the root.

The line **Solid or flux cored** applies only to GTAW. When the column indicates that “solid” is qualified, the welder may use solid wire (e.g., ER80S-B2) or tubular wire that is filled with powder metal (e.g., ER80C-B2), but not flux cored wire (e.g., E80T1-B2). When the column indicates that “flux cored” wire is qualified, the welder may weld using flux cored (e.g., E308LT-5) wire, but he may not weld using solid or metal cored wire. Flux cored wires are sometimes used in lieu of backing gas when welding stainless steel. NCPWB contractors do not presently use flux cored wire for GTAW.

The line **Consumable Insert** indicates whether or not the welder is qualified to use a consumable insert. This line only applies to GTAW. “Required” in this column means that the welder is qualified to use a consumable insert, and a “None” means that he is not qualified to use an insert. Welders qualified to use inserts may make fillet welds and groove welds on backing. Most welders who are qualified to use inserts will have other qualifications for welding open root without an insert.

The line **Deposit thickness** is the maximum thickness of weld metal that the welder may deposit on any thickness of base metal using the process. That is, if the record says that the deposit thickness limit is 0.375 inches, the welder may not deposit more than .375 inches of weld metal in a joint. “Unlimited” means that the welder may deposit the maximum thickness permitted by the applicable WPS without further qualification. When a welder is qualified using two welding processes (e.g., GTAW/SMAW), this line will show two thicknesses (e.g., 0.10/0.664). That means that the welder is qualified to deposit weld metal up to the maximum thickness for each process respectively (i.e., in the example, the welder may deposit 0.10 inches of GTAW and 0.664 inches of SMAW. You may also see two thicknesses when E6010 is used for the root pass and E7018 for the fill passes. The same concept applies.

The line **Positions** indicates the positions in which a welder may weld. Welding positions are flat, vertical, horizontal and overhead. They are defined in Figures QW-461.1

and QW-461.2. Except for a few tests that are for shop welding, NCPWB welders are qualified for all positions.

The line **Uphill/Downhill** indicates whether the welder is qualified to weld uphill or downhill when welding in the vertical position. The welder may only weld using the progression for which he is qualified. Most of the time progression is uphill. Common exceptions are WPSs 1-2-1 for E6010 downhill and procedures for GMAW short circuiting (1-5X-X type) where downhill is commonly used for the root pass.

The line **Backing Gas** indicates whether or not the welder is required to use backing gas when he welds. When this line says “required,” the welder must use backing gas; when the line says “optional,” the welder may weld with or without a backing gas, depending on what the WPS that he is following in production requires. When the welder is welding on backing (i.e., backing ring or strip, root pass by another process, fillet, partial penetration weld or weld made from two sides), this variable may be disregarded.

The line **GMAW Transfer** addresses the GMAW metal transfer modes that the welder may use. When the data in the column is “SC,” the welder may only weld using the short circuiting transfer mode. When the data in the column indicates “Spray, globular or pulse” the welder may use the spray transfer, the globular transfer or the pulse transfer modes. The transfer mode is shown on the WPS.

The line **GTAW Current** indicates that welder is qualified to weld using AC or DC, and in DC, whether he is qualified to use electrode positive (DCEP) or electrode negative (DCEN). Sometimes DCEN will be referred to as “straight polarity” (DESP) and DCEN will be referred to as “reverse polarity” (DCEP). This column only applies to GTAW.

Examples

The **Range Qualified** column is the source of all information about what a welder is qualified to do.

- When the **Welding Process** line says GTAW, the welder may only weld using GTAW.
- When the **Base Metal** line says that a welder is qualified to weld on P-1 through 15F, that means that the welder may weld on all materials that are assigned any P-number from 1 through 15F including combinations between numbers, such as P-1 to P-8.
- When the **Filler Metal or Electrode F-Number** line says F-1 through F-4, that means that the welder may use any electrode assigned F-1 through F-4.
- When the **Backing** line says that backing is required, that welder may only weld using a backing ring, a root pass made using another process or he may make the weld from both sides of the joint.
- When the **Plate or Pipe** line says 2-7/8 in OD and larger, the welder may only weld on pipe 2-7/8 inches OD and larger (which includes plate).
- When the **Backing Gas** line says “required,” the welder must use a backing gas.

- When the **Deposit Thickness** line says “0.560 in. max,” the welder may not deposit more than 0.560 inches of weld with that process in a joint.

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