

WELD PROCEDURE AND WELDER QUALIFICATIONS- TERMS AND DEFENITIONS

There is significant confusion when it comes to weld and welder qualifications, a lot of this confusion stems from the various acronyms and abbreviations used to describe the various processes: PQR, WQR, WPQR, WPS etc.

The table below aims to dispel that confusion and clearly set out what is meant when we talk collectively about '*weld qualifications*'.

TERM	DEFENITION										
Welder	A person who manually operates a welding torch to fuse materials together.										
WPS <i>'Weld Procedure Specification'</i>	A document that a welder follows when welding a joint. The WPS will list critical information such as root gap, edge preparation, material and consumable grades, current, amperage and travel speed.										
pWPS <i>'Preliminary Welding Procedure Specification'</i>	A pWPS is a document issued to a welder when he carries out a 'Weld Procedure Test'. The pWPS will contain some of the critical information displayed on a fully qualified WPS but will not have any details such as travel speed or amperages as these will be only be determined during the actual test.										
Weld Procedure Test <i>The act of qualifying a WPS.</i>	<p>The welder will review the pWPS and the test piece to ensure they have the correct consumables, edge preparation, welding process etc.</p> <p>The welder then welds the test piece under the supervision of a weld inspector or certifying body (CB). The designated person (usually the weld inspector) will capture critical information during the Weld Procedure Test- Information such as Amperage settings, Volts and travel speed. He will also verify that the materials match those stated on the pWPS. He does this by reviewing the Material Test Certification and material markings.</p>										
WPQR <i>'Weld Procedure Qualification Record'</i>	<p>The test piece is then sent away to a laboratory or 'test house' and will be subject to numerous destructive and non-destructive tests. The tests vary by standards but common tests are as follows:</p> <table> <tr> <td>Radiography:</td><td>Volumetric examination to check for internal defects.</td></tr> <tr> <td>Side bend/face bend:</td><td>Samples are pulled around a specific former to check finished material ductility and internal fusion.</td></tr> <tr> <td>Hardness Tests:</td><td>To determine if parent material is still within design specification.</td></tr> <tr> <td>Tensile Tests:</td><td>To determine if parent material is still within design specification.</td></tr> <tr> <td>Impact Tests:</td><td>To determine if parent material is still within design specification.</td></tr> </table>	Radiography:	Volumetric examination to check for internal defects.	Side bend/face bend:	Samples are pulled around a specific former to check finished material ductility and internal fusion.	Hardness Tests:	To determine if parent material is still within design specification.	Tensile Tests:	To determine if parent material is still within design specification.	Impact Tests:	To determine if parent material is still within design specification.
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	<p>If the test results conform to the original material specification the Certifying Body (CB) will issue a WPQR which lists the critical information collected during the Weld Procedure Test. The WPQR also lists the results of testing carried out at the laboratory and test house.</p> <p>We then have a record proving that if we weld that material, using those variables (consumables, amps, volts, travel speed etc) we can be confident that the resulting weld will have sound mechanical properties in line with the results recorded on the WPQR and in line with the original material specification.</p> <p>Depending on the overarching standard the WPQR will qualify the organisation to weld a range of materials, thicknesses and product forms. The ranges on WPQR will vary based on standard.</p>
WPQ <i>'Welder Performance Qualification'</i>	<p>A welder is issued a WPS and uses the information on the WPS to weld a test piece under the supervision of a weld inspector or certifying body (CB).</p> <p>The test piece is sent away for destructive testing such as side bend or face bend OR non-destructive testing (NDT) such as Radiography. If the test piece passes the welder is then qualified to weld that joint and a small range around that joint.</p> <p>It is important to note that the test piece does not require the extent of testing required for a WPQR as we already know that the mechanical properties of the joint are sound because we have welded it in accordance with a previously qualified WPS.</p>
WQR <i>'Welder Qualification Record'</i>	<p>When a welder passes a WPQ the certifying body (CB) that witnessed the test will issue a Welder Qualification Record or WQR. The WQR lists the details of the test including the WPS followed, the material welded, the consumables used etc.</p> <p>Depending on the overarching standard the WQR will qualify the welder to weld a range of materials, thicknesses and product forms. The ranges on WQR are usually larger than the ranges on a WPQR because the welder has verified that he has the competency to follow one WPS so he is likely competent to follow other WPS also.</p>
P No	<p>P Numbers are groupings of similar parent material types.</p> <p>For example in ASME IX: P1 to P15 cover Steel and all steel alloys P21 to P26 cover Aluminium and it's alloys P31 to P35 cover Copper and its alloys, P41 to P49 cover Nickel and Nickel alloys etc.</p>

	<p>Both ASME and EN 15614 use the material grouping methodology to cut down the number of WPQR's that an organization must have to weld a project.</p> <p>The reasoning behind this is 304l St Stl (P8 Group 1) welds much the same as 316L St Stl so it is also placed in P8 Group 1. This means that a Weld Procedure Test carried out on 304 St Stl will cover the organization to weld 316L St Stl which ultimately cuts down the need for the organization to hold two WPQR (one for 304 and one for 316L).</p> <p>Likewise, a Weld Procedure Test carried out on Inco 800H/HT (UNS N08811) will also cover you to weld Inco 825 (UNS N0 8825) as they are both P45 materials.</p> <p>There are some intricacies involved with this as some P No's also have Group No's but the general ethos stands.</p> <p>Understanding P No's and the framework around them can save organisations an awful lot of money in the long run.</p>
F No	<p>F No's are groupings of similar Filler and electrode types.</p> <p>As per P No's above F No's can greatly reduce the amount of WQR or Welder Qualifications an organization must hold.</p> <p>Welders are generally qualified by F No's, so if a welder welds a coupon using the TIG process with an F6 filler wire he is generally qualified to weld using all F6 fillers regardless of the parent material type.</p> <p>Again, there are intricacies and caveats with this but the general ethos stands.</p>
Variables	<p>Variables are qualities of a WPS that can change, for example: Parent material, welding process, Consumable types and grade, backing gas, flux etc.</p> <p>Some Variables are more important than others as changing them can change the mechanical properties of the weld, these are termed <i>Essential Variables</i> other variables do not alter mechanical properties and are termed <i>Non-Essential Variables</i></p> <p>I offer more on this in the free download '<i>Variables-Essential, Non-Essential and supplementary Essentials-An Explainer</i>'</p>