

Lesson 3 – Reading a WPS Fact Sheet

Where a WPS Comes From

- Welding Procedure Specifications are typically used by certified welders and derived from welding code standards
- A company can select a welding code to use, or create own standards
- If a welding code is selected by the company performing the welding, that company will use welding procedures based on the welding code
- A WPS can be prequalified by a welding code
- If a welding procedure does not exist for a design, the procedure must be qualified

Welding Code

- There are several different types of welding codes and procedures for all metals and uses
- Welding codes come from organizations such as:
 - American Welding Society (AWS)
 - American Society of Mechanical Engineers (ASME)
 - American Petroleum Institute (API)
 - International Organization for Standardization (ISO)
 - Canadian Standards Association (CSA)
 - European Committee for Standardization (CEN)

Steps to Qualify a WPS & Welder

Steps to Qualifying a Welding Procedure and Certifying a Welder

1. Analyze joint design
2. Write a Welding Procedure Specification
3. Qualify welding procedure
4. Qualify welder
5. Certify welder

STEP 1

Analyze Design

- Joint design
- Weld type
- Size of weld
- Location of weld

STEP 2

Write a Welding Procedure Specification

- A Certified Welding Inspector or a Welding Engineer will write a WPS for the design
- In this step, the WPS is based on information in the welding code used by the company; it is essentially an educated guess on what would work
- This WPS will need to be tested by a skilled certified welder in the next step



STEP 3:

Qualify Welding Procedure

- A certified welder performs welds in accordance to the WPS
- Several specimens are welded
- Welded specimens are tested using destructive and/or nondestructive testing methods
- Once all tests are passed, the procedure has been proven to work

STEP 4:

Qualify Welder

- Welders will take a welding qualification test in accordance to the qualified WPS
- The welder qualification test is typically similar to the one used to qualify the WPS
- A Certified Welding Inspector will test the weld specimens using destructive and/or nondestructive testing methods and determine whether the test passed or failed

STEP 5:

Certify Welder

- Written verification that welder met the standards of the test
- A Certified Welding Inspector needs to be present while welder is testing to insure that the test was completed in accordance to the WPS
- The welder is certified **ONLY** to the specified positions, electrodes, filler metals, metal thicknesses, etc. that is specified in the welding code or company standards that the welder took the test for
- Certifications do not transfer between companies and welding codes
- There is no such thing as a universal welder certification

READING A WPS

Welding Procedure Specification Definition

According to American Welding Society standard AWS A3.0M/A3.0:2010 Standard Welding Terms and Definitions:

“A document providing the required welding variables for a specific application to assure repeatability by properly trained welders and welding operators.”

Parts of a WPS

Although every WPS is a little different, these are some of the main parts that are common in most of them.

- General Information
 - Tells the welder about where the procedure comes from and who it's for
 - Company information
 - Welding process
 - Identification number
 - How the weld is performed (manual, automatic, semiautomatic, mechanized)
- Joint Design
 - Tells the welder about preparation of the welding joint
 - Type of joint design



- Backing required
- Specifics about the joint regarding root opening, root face, groove angle, radius of groove, whether back gouging is required
- Position
 - Tells the welder what position the joint is to be welded in
 - Position to be welded: this is expressed with a number and a letter
 - The number indicates the position
 - 1 is flat
 - 2 is horizontal
 - 3 is vertical (progression up or down is also indicated)
 - 4 is overhead
 - The letter indicates whether it is a fillet or groove joint
 - G is a groove weld
 - F is a fillet weld
- Example: 1F indicates flat fillet, 3G indicates vertical groove
- Electrical Characteristics
 - Tells the welder about the electrical setup of the welder
 - Transfer Mode for GMAW (short circuit, pulse, spray, globular)
 - Current, or polarity being used (DCEP, DCEN, or AC)
 - Power source (constant current or constant voltage)
- Base Metals & Filler Metals
 - Tells the welder what type of metal can be welded on and the matching filler to use
 - Thickness range of the base metal
 - Material specification: all base and filler metals have specification numbers that identify the type of metal
 - Filler metal classification: a number that tells the welder about the filler metal
 - Specifications and classifications for base and filler metals are defined by standardizing organizations. These numbers tell the welder what the metal is and what alloys are present in the metal
- Shielding
 - Tells the welder what type of shielding gas or flux is used
 - Type of shielding gas and the composition of a shielding gas mixture
 - Flow rate
 - Where to set the flow meter
 - Gas cup size
 - Even the size of the nozzle is specified!!
- Technique
 - Tells the welder how to make the weld
 - Stringer or weave bead
 - Number of passes required
 - Contact tube to work distance
 - Interpass cleaning
- Preheat & Post-heat
 - Tells the welder how to heat the base metal
 - Preheat and interpass temperatures
 - Post-weld heat temperature

- Length of time a post-weld heat treatment is held
- Welding Procedure
 - All parts of a WPS must be carried out for the weld to be considered sound
 - Quality control in a welding shop will make sure welders are carrying out the WPS
 - Check volts and amps with multi-meter
 - Check to see that proper electrodes, filler metal, and shielding is being used
 - Check the travel speed, temperature of metal, and other variables in WPS
 - Welds made by a WPS are often tested using destructive or nondestructive examination