QUALIFICATION OF PROCEDURES & WELDERS

The American Welding Society (AWS) Structural Welding Code – Steel, D1.1-2010, is the code for fabricating and erecting welded steel structures. The code was specifically developed for welded steel structures that utilize carbon or low alloy steels that are 1/8 in or thicker.

Per AWS D1.1 Clauses 3 and 4, qualification with respect to the performance of welding is required for the following:

1. The welding procedure itself (WPS), either prequalified or qualified by test
2. The welder performing the work (WPQ)

The welding contractor is responsible for the development and documentation of all welding procedures and for the qualification of their welding personnel.

DEFINITIONS - AWS A3.0; Standard Welding Terms & Definitions

Prequalified Welding Procedure Specification (PWPS) – a welding procedure specification in compliance with the stipulated conditions of a particular welding code or specification and therefore acceptable for use under that code or specification without a requirement for qualification testing.

Welder Performance Qualification (WPQ) (or Welder Certification) – written verification that a welder has produced welds meeting the prescribed standards of welder performance.

Welding Procedure Qualification Record (WPQR) - a record of welding variables used to produce an acceptable test weldment and the results of tests conducted on the weldment to qualify a welding procedure specification.

Welding Procedure Specification (WPS) - a document providing the required welding variables for a specific application to assure repeatability by properly trained welders.
QUALIFICATION OF PROCEDURES & WELDERS STEPS

**STEP 1**  
**Develop WPS**

**Prequalified?**

Yes, skip **STEP 2**

No, **STEP 2**  
Develop PQR

**STEP 3**  
Develop Welder Certifications

### STEP 1 – DEVELOP WPS:

Develop the welding procedure:

1. The weld procedure must precede the welder qualification
2. The weld procedure must proceed production or field welding
3. A welding procedure is performed to show the compatibility of the following:
   a. Base metal(s)
   b. Weld filler metal(s)
   c. Weld processes
   d. Welding technique(s)

There are three general approaches to procedure qualification:

1. Prequalified procedures
2. Actual procedure qualification testing
3. Mock-up tests for special applications (*not addressed in this document*)

There are numerous procedures which are *prequalified* – a Prequalified Welding Procedure Specification (PWPS). This means that a qualification test for the weld procedure is not required. AWS D1.1 prequalified procedures cover joints, processes, and positions.

If a weld procedure is prequalified, you do NOT need a qualification test for the procedure. However, a written WPS is still required to be on file.

Each process and weld joint configuration for a project requires a welding procedure specification (WPS). A test WPS is not sufficient. **A WPS is basically the recipe that the welder follows to ensure that he will produce a sound weld.**

**In order to be valid, the WPS must be approved and dated by the organization who authorized the WPS.**
Welding Procedure Specification (WPS)

A welding procedure specification should include the following:

- Company Name
- Welding Process
- Supporting PQR’s
- Identification No.
- Revision No.
- Date
- Authorizing Individual
- Joint Design
- Base Metals
- Filler Metals
- Shielding
- Preheat
- Position
- Electrical Characteristics
- Technique
- Post-weld Heat Treatment
- Welding Procedure Information

Per AWS D1.1 Clause 3, all prequalified WPS documents shall be written. A WPS can be written by a CWI or a qualified individual. Each welding process and weld joint configuration specified on the project drawings requires a welding procedure specification (WPS). For example, fillet welds, PJP welds, and CJP welds may be specified. Groove welds may be single bevel or double bevel.
STEP 2 – DEVELOP WPQR:

If your weld procedure is NOT prequalified per AWS D1.1 Clause 3, you need a qualification test for the procedure per AWS D1.1 Clause 4.

A welding procedure specification should include the following results and information:

- ✓ Tensile Test
- ✓ Guided Bend
- ✓ Visual Inspection
- ✓ Radiographic-Ultrasonic
- ✓ Fillet Weld Test
- ✓ Welder’s Name
- ✓ Testing Authority Name & Signature
- ✓ Manufacturer or Contractor’s Representative Title, Date, Signature

Examples of welding that is not prequalified:

- ✓ Vertical downward progression
- ✓ Open root CJP without backing and back gouge
STEP 3 – DEVELOP WELDER CERTIFICATIONS (QUALIFICATION TEST RECORD):
A welder certification or qualification test record is written verification that a welder has produced welds meeting a prescribed standard of welder performance.

A welder certification should include the following:
- Company Name
- Welding Procedure No.
- Identification No.
- Revision No.
- Date
- Authorizing Individual & Date
- Variables
- Visual Inspection Results
- Fillet or Bend Test Results
- Radiographic Test Results (in lieu of mechanical testing)
- Testing Authority Name & Signature

Areas of Interest for Telecom:
Test records should be for either SMAW (stick) or FCAW (wire) depending on the process (1) being used. Filler metal tensile strength should match the drawing requirements – stick E7018 or E8018; wire E71 or E81 (2). **NOTE:** GTAW (gas tungsten arc welding or TIG) and GMAW (gas metal arc welding or MIG) are not typically appropriate for field welding in the telecom industry.

For welding in the telecom industry, the test positions (3) should be 3G for vertical welds (stiffener welds) with uphill progression and/or 4G for overhead groove welds (pole flanges, etc).

The material thickness qualification range should cover the range of materials being welded (example 1 ¼” thick stiffeners). (4)

Period of Effectiveness (AWS D1.1; 4.1.3) – The welder’s qualification shall be considered as remaining in effect indefinitely unless the welder is not engaged in a given process of welding for longer than 6 months. Documentation of welder continuity should be maintained or recertification may be required. (5)
In order to become valid, the WPS must be approved and dated by the organization who authorized the WPS. (6)
WHAT CAN BE CHANGED BEFORE A RE-TEST OF THE WELDER IS REQUIRED?

Essential variables are those features which, if changed beyond certain limits, require that a welder be recertified. Per AWS D1.1, Table 4.12, some of the following essential variable changes require requalification:

- To a welding process (SMAW, FCAW, etc.) not qualified
- To an SMAW electrode with an F-number higher than the WPQR electrode F-number
- To a position not qualified (i.e. overhead)
- To a diameter or thickness not qualified
- To a vertical welding progression not qualified (i.e. uphill or downhill)
- The omission of backing material in the joint

WHAT WELDS ARE TYPICALLY USED IN THE TELECOM INDUSTRY?

For monopole upgrades, we are welding high strength steel (typically A572 Grades 50, 60, 65) with SMAW (stick) or FCAW (wire). Weld filler material is typically E7018 or E8018; wire is typically E71 or E81. Positions are typically horizontal, vertical up, or overhead. Welds include fillets, partial penetration joints (PJP; single bevel groove and double bevel groove) and complete joint penetration (CJP; single bevel groove and double bevel groove).

Base Plate Stiffeners and/or Anchor Rod Brackets:

- Vertical Fillet Welds
- Horizontal Double Bevel Groove PJP Weld with Reinforcing Fillet Weld - OR - Horizontal Double Bevel Groove CJP Weld with Reinforcing Fillet Weld
Base Plate Foot Pads:
Flat Single Bevel Groove PJP Weld - OR – Flat Single Bevel Groove CJP Weld

Bridge Stiffeners:
Vertical Fillet Welds & Horizontal Double Bevel Groove PJP Welds with Reinforcing Fillet Welds

Pole Top Flange for Extension:
Vertical Fillet Welds & Horizontal Single Bevel Groove CJP Welds with Reinforcing Fillet Welds