QUALIFICATION OF PROCEDURE AND WELDER

(19 February 2014)

QUALIFICATION OF PROCEDURE AND WELDER

- The most important tasks prior production welding
- Welding qualifications are statements by which the welding procedures and personnel have been tested in accordance with the proper codes or specifications and found to be acceptable

PROCEDURE QULAIFICATION

- Should be considered before both the welder qualification and the production welding are taken
- Demonstrate the compatibility of
 - **4** Base metal;
 - # Filler metal;
 - Process(es);
 - Techniques; and
 - Welding conditions

ADVANTAGES

- # Eliminate the possibility of reject of weld
- # Eliminate project delay
- Cost effectiveness
- Enhance quality (both in weld and project)
- Able to identify problems when, or even before the problems occur

PROCEDURE QULAIFICATION

- # Approaches to procedure approval by
 - Pre-qualified procedures <a>________
 - + Actual procedure qualification testing 1
 - Mock-up tests for special applications <a>0



Pre-qualified Procedure

- No need perform actual qualification testing as long as the welding parameters are within certain prescribed limits
- AWS D1.1 to D1.5 and D9.1 contain prequalified procedures for various aspects
 - AWS D1.1 Structural welding code Steel
 - AWS D1.2 Structural welding code Al
 - 4 AWS D1.3 Structural welding code Sht Steel
 - ♣ AWS D1.4 Structural welding code Reinforced
 - ♣ AWS D1.5 Bridge welding code
 - AWS D9.1 Sheet meta welding code

Pre-qualified Procedure

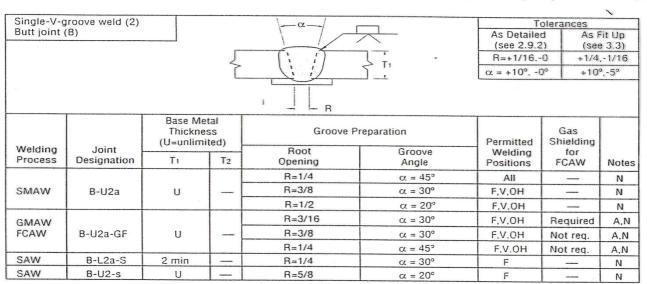
- Essential variables are listed 4
- AWS D1.1 list out the essential variables including 4 the followings (but not limit to)
 - Welding Processes (SMAW, SAW, FCAW, GMAW) except SC transfer)
 - + Base metal & filler metals Thickness ranges covered
 - Configuration and techniques
- If the essential variables changed beyond certain limits, require a new procedure qualification

ONE WAY

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Pre-Qualified Procedure (AWS D1.1)

Jocuments Governing Welding Inspection and Qualification



Note A: Not prequalified for gas tungsten arc welding and gas metal arc welding using short circuiting transfer. Refer to Appendix A.

Note C: Note J: Backgouge root to sound metal before welding second side.

backgodge root to sound field before weiging second side. If fillet welds are used in statically loaded structures to reinforce groove welds in corner and T-joints, they shall be equal to 1/4T, but need not exceed 3/8 in. Groove welds in corner and T-joints of dynamically loaded structures shall be reinforced with fillet welds equal to 1/4 T₁, but not more than 3/8 in.

Note N: The orientation of the two members in the joints may vary from 135° to 180° provided that the basic joint configuration (groove angle, root face, root opening) remain the same and that the design weld size is maintained

Source: ANSI/AWS D1.1

Example of AWS Prequalified Weld Joint Limitations.





Pre-qualified Procedure

- Other typical pre-qualified procedures are:
 - 4 ASME Section IX (Welding and Brazing Qualification)
 - ↓ API -1104 (Standard for Welding Pipelines and Related Facilities)
- Defines essential variables
 - **Welding** processes
 - Base metal and filler metals
 - **4** Thickness
 - Configuration and techniques
- Testing required

Pre-qualified Procedure in BS EN

- # BS EN 288-7:1995 <u>(</u>)
 - Specification & Approval of Welding Procedures for Metallic Materials Part 7 - Approval by a Standard Welding Procedure for Arc Welding
- **BS EN 288-5: 1994**
 - Specification & Approval of Welding Procedures for Metallic Materials Part 5 - Approval by using Approved Welding Consumables for Arc Welding
- Specification & Approval of Welding Procedures for Metallic Materials Part 6 Approval related to Copyright (KC Wong) evious Experience 10

BE EN 288-7: 1995

- Covering ranges for all relevant parameters.
 - user of standard welding procedure,
 - welding equipment,
 - personnel qualification,
 - environmental conditions
- 4 Shall be in the format of either a WPS or a WPAR
- 4 Shall be signed and dated by the examiner or test body
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BE EN 288-5: 1994

- Based on approved consumable
- Shall specify the range for all the relevant parameters
- 4 Shall be carried out by an examiner or test body
- The essential items for the approval are:
 - Specifications of parent metal(s) to be used
 - Records of the approved consumables to be used
 - A specific pWPS suitable for the application

BE EN 288-6: 1995

- # Shall be carried out by an examiner or test body
- 4 Shall demonstrate previous experience by
 - 4 Documented exam and/or test data
 - 4 Satisfactory documentation of tests, and
 - A summary of welding manufacturing of at least one year
 - Suitability of welds in service for an

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Welding Procedure Qualification ASME Qualification

- Welding Procedure Specification (WPS)
 - written document which are greater in detail, to give guidance to the welder, or welding operator, performing production weldments
 - states both essential and non-essential variables
 - a new or revised WPS and re-qualification is required if a change is made in one or more of the essential variables

Welding Procedure Qualification ASME Qualification

- Procedure Qualification Record (PQR)
- May also be called as Welding Procedure Qualification Record (WPAR)
 - * A form to record actual test condition including the essential variables, welding process, test result, etc.
 - ♣ A change in any essential variable shall require requalification and to be recorded in another PQR.
 - If a change is made to one or more of the nonessential variables, there may be numerous PQR referencing a single WPS

Welding Procedure Qualification

- + Test Required 0
 - Test specimen are removed and destructively tested to be judged as acceptable or rejectable based on the accompanying requirement
 - **4** Common tests
 - Tensile, Bend (face, root, side)
 - 4 Macro-etch, Fillet break
 - **+** NDT
 - **♣** Other tests

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BE EN 288-3: 1997

Specification & approval of welding procedures for metallic materials

Part 3. Welding procedure tests for the arc welding of steels

Superseded by EN ISO 15614-1:2004

Specification and Qualification of Welding Procedures for Metallic Materials - welding Procedure Test

Part 1 Arc and Gas Welding of Steels and Arc Welding of Nickel and Nickel Alloys

Mock-Up Test

- Is a actual trial welds on joint in order to solve the problem
- + Sometimes used for complex and special joint configurations where a concern about the overall shape or condition might be greatly affected by the welding operation

Mock-Up Test

Applicable examples as high levels of restraint and inaccessible weld joints are possible causes of welding problems but these are more difficult to evaluate using a standard qualification test

BE EN 288-8: 1995

Specification & approval of welding procedures for metallic materials

Part 8. Approval by a pre-production welding test

