

Activity Weld Procedure Qualifications

1.0 Purpose To provide a method of ensuring that weld procedure qualifications are in compliance with regulations, standards, and procedures in effect at a nuclear power plant.

2.0 Scope This guideline applies to the plants which require ASME B&PV Code compliance regarding welding procedure qualifications.

References

1. ASME B&PV Code, Section IX.

3.0 Guidelines

3.1 In preparation for and during the conduct of this surveillance

- Obtain and review implementing procedures, instructions, and drawings governing this activity.
- Prepare a guide or checklist using the selected items from this guideline.
- Review past surveys, audits, surveillances, and other evaluations/assessments.
- Ensure that checklists include, where applicable, actual observations of performance, general plant conditions, radiological work practices, housekeeping, work document controls and use, and safety practices.

Note: Refer to Chapter 1 for specific details on the attributes listed above.

3.2 Do procedures address the methods and requirements for the content, review, verification, and qualification of welding procedures?

3.3 Do physical test procedures, as applicable, meet the specified requirements?

3.4 Do welding procedure specifications (WPS) adequately describe in detail all of the variables which are essential and nonessential to each particular welding process employed in that procedure?

3.5 In order to avoid sensitization in the heat-affected zone, has the arc heat input of any weld bead been calculated properly by use of the following formula and documented in the procedure qualification records: (See next question)

$$H = \frac{E \times I \times 60}{S}$$

where

H = energy input, Joules/in.

E = welding voltage, V

I = welding current, A

S = travel speed, in./min.

(See previous question)

Maximum Energy Input

Welding Process Method (kJ/in.)

GTAW	50
SMAW	120
GMAW	60
GTAW—hot wire	75
GTAW—cold wire	45
SAW	140
Flux-core welding	100

- 3.6 Does the WPS list in detail the P-numbers to be joined, the filler metals used, the range of preheat and postweld heat treatment, the thickness range, and other variables required for each process, both essential and nonessential?
- 3.7 Does the WPS adequately provide the welder with the direction he needs to weld in accordance with the code?
- 3.8 Is the WPS available for reference by the welders and the authorized inspector?
- 3.9 Is the WPS data included on the WPS form adequately classified as either essential, supplementary-essential, or nonessential variables, as addressed in the applicable sections of ASME Section IX, Article IV, QW-400, "Variables"?
- 3.10 Is the WPS in a form that meets each required essential and nonessential variable required by QW-252 through QW-282? When necessary are all additional specifications and directions for the welder attached to the WPS?
- 3.11 Are the procedure qualification records maintained adequately and do they include such criteria as the welding test coupon(s), the testing of specimens, the recording of welding data, and the test results?
- 3.12 Are WPS being adequately qualified by the welding of test coupons, the testing of specimens, recording of welding data and test results, and documenting in the procedure qualification record (PQR)?
- 3.13 Does the PQR list the limits of a narrow range and include all additional information required as essential variables?
- 3.14 Do all WPS cover such details important to the production such as the base metal P-number, group number, base metal specification type and grade (or chemical analysis and mechanical properties), the range of preheat and postweld heat treatment, thickness, and other variables as either essential or nonessential?
- 3.15 Are the types of tests required satisfactorily meeting the requirements for mechanical tests (QW-202.1), base metals—groove and fillet welds (QW-202.2), and stud welding (QW-202.3)?

- 3.16 Is the preparation of test coupons meeting the requirement parameters of paragraphs QW-211 through QW-216?
- 3.17 Are welding variables, such as the types of variables for WPS, adequately meeting the general paragraph requirements of QW-251?
- 3.18 Are all special processes and the applicable essential and nonessential variables satisfactorily meeting each condition requirement specified in ASME Section IX, Paragraph QW-281, QW-282?
- 3.19 Does each manufacturer or contractor performing safety-related brazing list the parameters applicable to brazing that he/she performs in accordance with the ASME Code?
- 3.20 Are brazing procedure qualifications being conducted in accordance with ASME Section IX, Article XII?
- 3.21 Is each manufacturer or contractor qualifying the brazing procedure specification (BPS) by the brazing of test coupons and the testing of specimens, and are these brazing data and test results documented as a PQR?
- 3.22 Does the BPS list in detail such attributes as the various base metal P-numbers, filler metals used, brazing temperatures range and thickness, as well as provide the brazer or brazing operator with the necessary direction he /she needs to braze in accordance with the ASME Section IX Code?
- 3.23 Does the program for performing brazing include the manufacturer or contractor, certify he/she has qualified each BPS and satisfactorily met the requirements of ASME Section IX, Paragraph QB-201.1?
- 3.24 Does the form used to document the PQR satisfactorily meet the parameters specified for this and the remaining requirements for the PQR referenced in ASME Section IX, Paragraph QB-201.2?
- 3.25 Are the types and numbers of test specimens that must be tested to qualify the BPS satisfactorily meeting the requirements specified by ASME Section IX, Paragraph QB-202.1?
- 3.26 Does the procedure qualification encompass the thickness ranges to be used in production for the base metals to be joined or repaired as given in ASME Section IX, Paragraph QB-451?
- 3.27 Are the limits of qualified flow positions for procedures (see QB-461) satisfactorily meeting the criteria specified in QB-203.1, QB-203.2, and QB-203.3?
- 3.28 Is the preparation of test coupons satisfactorily meeting the requirements specified in ASME Section IX, Paragraphs QB-211 and QB-212?
- 3.29 Are the variables for brazing procedure specifications (BPS) listed as essential variables (listed in QB-252) satisfactorily being met as specified in ASME Section IX, Paragraphs QB-251.1, QB-251.2, and QB-252?
- 3.30 When a combination of weld processes or procedures is required to be used, is each welding process or procedure qualified either separately or in combination with other processes to be used in the production joint?

- 3.31 Is each manufacturer, installer, or assembler conducting the tests required in this section to qualify the brazing procedures he/she uses in the construction of the brazing assemblies built under ASME Section IX, as well as the performance of brazers and brazing operators who apply these procedures?
- 3.32 Have all qualification records of welding procedures and personnel performing special processes been filed and maintained, and are they available for verification?
- 3.33 Does each manufacturer or contractor maintain adequate records of the test results obtained in qualifying brazing procedures and brazer or brazing operator qualifications?
- 3.34 Are all tests specified as performance qualification tests, as referenced in ASME Section IX, Paragraph QW-301, including the intent of tests, qualification tests, identification of welders and welding operators, and record of tests, satisfactorily being carried out in accordance with ASME Section IX QW-301?
- 3.35 Are the different types of tests, such as mechanical tests (QW-302.1), radiographic examination (QW-302.2), and test coupons in pipe (QW-302.3), being conducted in accordance with ASME Section IX, Paragraph QW-302?
- 3.36 Are welds being made within the limits of qualified positions (see QW-461 and QW-461.7) for groove welds (General & Positions 1G & 2G, single welds with backing), groove welds (Positions 1G & 2G only, single welds without backing), groove welds (Positions 1G & 2G only, double welds), fillet welds, special positions, and stud weld positions referenced in QW-303.1 through 303.8?
- 3.37 Do all test coupons satisfactorily meet the requirements specified in ASME Section IX, QW-310.1 through QW-310.8?
- 3.38 Are the criteria and special conditions such as dimensional and chemical properties specified for base metals, filler metals, positions, preheat, postweld heat treatment, gas, electrical characteristics and technique specified in ASME Section IX, QW-402 through QW-410 satisfactorily met?
- 3.39 Do test specimens meet the requirements listed for tension tests and transverse bend tests (QW-451.1), tension tests and longitudinal bend tests (QW-451.2), plate fillet weld tests (QW-451.3), and fillet welds qualified by groove weld tests (QW-451.4)?
- 3.40 Do brazing test coupons meet the requirements specified in ASME Section IX, QB-310.1, QB-310.2, and QB-310.3?

4.0 Other Guidelines for Consideration

- 4.1 See Chapter 1, "General Quality Surveillance Guidance."
- 4.2 See Chapter 22, "Welding."
- 4.3 See Chapter 22, "Brazing."