PW-27.2 Arc stud welding and resistance stud welding may be used for nonpressure-bearing attachments having a load- or nonload-carrying function. Stud size shall be limited to 1 in. (25 mm) diameter maximum for round studs or an equivalent cross-sectional area for studs with other shapes. For load-carrying attachments, the requirements of PW-28.6 shall be met prior to the start of production welding, and the postweld heat treatment requirements of PW-39 shall also be complied with.

PW-27.3 The electroslag welding process may be used for butt welds only in austenitic stainless steels of types listed in PW-5.3 and ferritic steels. Electroslag welds in ferritic steels require special NDE [Table PW-11, General Notes (a) and (b)] and special heat treatment (PW-39.7).

PW-27.4 Capacitor discharge welding may be used for attaching bare wire thermocouples to pressure-containing parts within the limitations given in PW-39.8.

PW-27.5 Definitions are given in Section IX, which include variations of these processes.

PW-27.6 When welding UNS N06230 with filler metal of the same nominal composition as the base metal, only GMAW or GTAW processes are allowed.

PW-28 WELDING QUALIFICATION AND WELD RECORDS


PW-28.1.1 Except as permitted in PW-28.1.2, the Welding Procedure Specifications, welders, and welding operators shall be qualified in accordance with Section IX.

PW-28.1.1.1 For welds joining two different P-No. materials, if the required transverse tension test fails in the weld metal and does not satisfy the criteria in Section IX, QW-153.1, an alternate test may be performed in accordance with the following requirements:

(a) The alternate welding procedure qualification tensile testing shall be performed at the lowest temperature at which the allowable stress values of either base metal is based on time dependent material properties, per Section II, Part D, Tables 1A and 1B, Notes T1 through T12, ±50°F (±28°C). In lieu of Section IX, QW-153, the tensile strength shall not be less than the value specified for the lower-strength base metal at the test temperature in Section II, Part D, Table U.

(b) The test temperature shall be documented on the WPS and the procedure qualification record (PQR).

(c) The design temperature shall be equal to or greater than the test temperature.

(d) The welding filler metal used in production is limited to the same classification or nominal manufacturing composition range used for the procedure qualification.

(e) During hydrostatic testing, the stress on the welded joint may not exceed 90% of the minimum specified yield strength of the filler metal specified in Section II, Part C. If the filler metal yield strength is not reported on the filler metal certified material test report (CMTR) or in the filler metal classification in Section II, Part C, the yield strength shall be determined using an all-weld-metal tension test specimen that has been removed from either the center of the weld metal of the procedure qualification test assembly or from a separate weld deposit buildup.

PW-28.1.2 For welding of nonpressure bearing attachments that have no load-carrying function (e.g., extended heat transfer surfaces, insulation support pins) to pressure parts, the following apply:

(a) Possession of a Certificate of Authorization by the organization performing such welding is neither required nor prohibited.

(b) Qualification of Welding Procedures and performance qualification is not required when the welding process is automatic.

(c) When the material used for the nonpressure part makes the mechanical test requirements for procedure qualification and performance qualifications impracticable (i.e., insufficient material ductility), a weld test coupon may be evaluated using the macro-examination method for both groove and fillet welds as follows:

(1) The test coupon may be of production configuration and shall be of sufficient length to contain a specimen for macro-examination.

(2) One face of the cross-section shall be smoothed and etched with a suitable etchant (see Section IX, QW-470) to give a clear definition to the weld metal and heat-affected zone.

(3) When heat treatment is a requirement of the WPS, it shall be considered a nonessential variable. All other Section IX variables remain.

(4) The weldable quality of the nonpressure part materials shall be verified by the macro-examination of a single cross-section of either the groove or fillet weld as in the production configuration.

(5) The groove weld may qualify a fillet weld.

(6) Macro-examination of the cross-sections of the weld metal and heat-affected zone of both the pressure part and nonpressure part material shall show complete fusion and freedom from cracks.

PW-28.1.3 Butt joints welded from one side (single-welded butt joints), including welds made to PW-41.2, where complete penetration at the root is required, shall conform to the following:

(a) Single-welded butt joint design shall be considered an essential variable.
Case 3021
Alternate WPS Qualification
Section I

Inquiry: When a welding filler metal is used that may not pass a room temperature tensile test for welding procedure specification (WPS) qualification but will meet the minimum tensile requirements during high temperature service, may an alternate tensile test at an elevated temperature be performed for the welded construction of Section I components?

Reply: It is the opinion of the Committee that the welding procedure specification (WPS) qualification shall be conducted in accordance with Section IX except that elevated temperature tensile tests in accordance with ASTM E21, Standard Test Methods for Elevated Temperature Tension Tests of Metallic Materials, may be performed when room temperature tensile tests do not pass the requirements of Section IX, QW-150, provided the following requirements are met:

(a) Welding procedure qualification tensile testing shall be performed at the lowest temperature at which the allowable stress values of either base metal is based on time-dependent material properties, per Section II, Part D, Tables 1A and 1B, Notes T1 through T12, ±50°F (±28°C). In lieu of Section IX, QW-153, the tensile strength shall not be less than the minimum specified tensile strength of the lower-strength base metal at the test temperature, as specified in Section II, Part D, Table U.

(b) The test temperature shall be documented on the WPS and the procedure qualification record (PQR).

(c) The design temperature shall be equal to or greater than the test temperature.

(d) The welding filler metal is limited to the same classification or nominal manufacturing composition range used for the procedure qualification.

(e) During hydrostatic testing, the stress on the welded joint may not exceed 90% of the minimum specified yield strength of the filler metal specified in Section II, Part C. If the filler metal yield strength is not reported on the filler metal certified material test report (CMTR) or in the filler metal classification in Section II, Part C, the yield strength shall be determined using an all weld metal tension test specimen that has been removed from the center of the weld metal of the procedure qualification test assembly or from a separate weld deposit buildup.

(f) This Case number shall be noted on the Manufacturer’s Data Report.