


**AWS B2.1/B2.1M:2009**  
**An American National Standard**



# **Specification for Welding Procedure and Performance Qualification**



**American Welding Society**

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**AWS B2.1/B2.1M:2009  
An American National Standard**

**Approved by the  
American National Standards Institute  
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# **Specification for Welding Procedure and Performance Qualification**

**5th Edition**

**Supersedes AWS B2.1:2005**

Prepared by the  
American Welding Society (AWS) B2 Committee on Procedure and Performance Qualification

Under the Direction of the  
AWS Technical Activities Committee

Approved by the  
AWS Board of Directors

## **Abstract**

This specification provides the requirements for qualification of welding procedure specifications, welders, and welding operators for manual, semiautomatic, mechanized, and automatic welding. The welding processes included are electro-gas welding, electron beam welding, electroslag welding, flux cored arc welding, gas metal arc welding, gas tungsten arc welding, laser beam welding, oxyfuel gas welding, plasma arc welding, shielded metal arc welding, stud arc welding, and submerged arc welding. Base metals, filler metals, qualification variables, welding designs, and testing requirements are also included.



**American Welding Society**

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## Foreword

This foreword is not part of AWS B2.1/B2.1M:2009, *Specification for Welding Procedure and Performance Qualification*, but is included for informational purposes only.

The AWS B2 Committee on Procedure and Performance Qualification was formed in 1979. The first edition of B2.1, *Standard for Welding Procedure and Performance Qualification*, was published in 1984. This standard introduced the concept of Standard Welding Procedure Specifications (SWPSs) in addition to a set of rules for qualifying welding procedures, welders, and welding operators. The following edition, renamed B2.1:1998, *Specification for Welding Procedure and Performance Qualification*, was an extensive revision of B2.1-84. The Committee has published sixty-two Standard Welding Procedure Specifications; B2.2, *Standard for Brazing Procedure and Performance Qualification*; B2.3, *Specification for Soldering Procedure and Performance Qualification*; and B2.4, *Specification for Welding Procedure and Performance Qualification for Thermoplastics*.

AWS B2.1-84, *Standard for Welding Procedure and Performance Qualification*, was revised in 1998, 2000, and 2005.

This is the fifth edition of B2.1, *Specification for Welding Procedure and Performance Qualification*. This revision has undergone several modifications including incorporation of SI units; a major reformatting effort that has renumbered existing clauses, tables, figures, and annexes; the addition of new sample forms; and the deletion of any reference to “sheet metals.” New welding and qualification variables and tighter restrictions have been made within 4.13 and 4.14. Table C.1 in Annex C, Filler Metal Groupings, has been updated to reflect revised filler metal specifications. Several new materials have been added in this edition within the Base Metal Groupings. Among the new additions are materials from Australian and New Zealand standards; a few new 10H materials, such as ASTM A 182, A 240, A 276, A 479, A 789, and A 790; and other adopted ASTM materials, including ASTM A 795, A 815, A 890, A 928, and A 995. In order to facilitate the adoption of new materials, the informative annex titled *Guidelines for Requesting Adoption of New Materials under the B2.1 Standard* has been added.

Underlined text in clauses, tables, or figures indicates an editorial or technical change from the 2005 edition. A vertical line in the margin also indicates a revision from the 2005 edition.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS B2 Committee on Procedure and Performance Qualification, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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# Specification for Welding Procedure and Performance Qualification

## 1. Scope

This specification provides requirements for welding procedure and welding performance qualification. It is the intent that this specification be referenced by other documents, such as codes, specifications, contracts, and quality control or quality assurance manuals. Such documents are recognized in this specification as Referencing Documents. Requirements imposed by the Referencing Document supersede the requirements of this specification.

The requirements for the qualification of welding procedures are provided in Clause 4, Procedure Qualification. The requirements for the performance qualification of welders and welding operators are provided in Clause 5, Performance Qualification.

This specification also defines and establishes qualification variables. Qualification requirements are based on the premise that the Referencing Document will specify fabrication, design, base metal, filler metal, preheat, interpass temperature, postweld heat treatment, nondestructive examination, and test requirements applicable to the product. Welding procedure and performance qualifications which meet the requirements of other codes and specifications are acceptable, provided they also meet the requirements of this specification.

Base metals and filler metals have been grouped into categories that will minimize the number of qualification tests required. Substitution of one base metal or filler metal for another, even when within the allowable rules, should only be made after an evaluation of the material's suitability for its intended use. For some materials, additional tests may be appropriate to verify the material's suitability. Materials not listed require separate qualification.

This specification is intended for use with the following welding processes:

- EBW = Electron Beam Welding
- EGW = Electroslag Welding

- ESW = Electroslag Welding
- FCAW = Flux Cored Arc Welding
- GMAW = Gas Metal Arc Welding
- GTAW = Gas Tungsten Arc Welding
- LBW = Laser Beam Welding
- OFW = Oxyfuel Gas Welding
- PAW = Plasma Arc Welding
- SAW = Submerged Arc Welding
- SMAW = Shielded Metal Arc Welding
- SW = Stud Arc Welding

Employers shall be responsible for the welding performed by their organization, including the use of qualified welding procedures, qualified welders, and qualified welding operators. The welding procedure may be an AWS Standard Welding Procedure Specification (SWPS) published by the American Welding Society, or it shall be qualified by the Employer as required under the rules of Clause 4, Procedure Qualification. It is the Employer's responsibility to assure that Welding Procedure Specifications (WPSs) meet all requirements of the Referencing Document.

When not otherwise specified by the Referencing Document, the edition of this specification to be used should be established in accordance with the following:

- (1) Editions may be used at any time after the effective date of issue.
- (2) Latest edition of this document should be used for new contracts.
- (3) Editions established by contract date may be used during the entire term of the contract, or the provisions of later editions may be used when agreed upon by the contracting parties.

This standard makes use of both U.S. Customary Units and the International System of Units (SI). The latter are shown within brackets [ ] or in appropriate columns in tables and figures. The measurements may not be exact equivalents; therefore, each system must be used independently.