AWS B2.1/B2.1M:2014
An American National Standard

Specification for Welding Procedure and Performance Qualification

American Welding Society®

AWS B2.1/B2.1M:2014
An American National Standard

Approved by the
American National Standards Institute
November 21, 2013

Specification for Welding Procedure and Performance Qualification

6th Edition

Supersedes AWS B2.1:2009

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 electrogas 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.

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This standard is subject to revision at any time by the AWS B2 Committee on Procedure and Performance Qualification. It must be reviewed every five years, and if not revised, it must be either reaffirmed or withdrawn. Comments (recommendations, additions, or deletions) and any pertinent data that may be of use in improving this standard are required and should be addressed to AWS Headquarters. Such comments will receive careful consideration by the AWS B2 Committee on Procedure and Performance Qualification and the author of the comments will be informed of the Committee's response to the comments. Guests are invited to attend all meetings of the AWS B2 Committee on Procedure and Performance Qualification to express their comments verbally. Procedures for appeal of an adverse decision concerning all such comments are provided in the Rules of Operation of the Technical Activities Committee. A copy of these Rules can be obtained from the American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166.

Dedication

The B2 Committee on Procedure and Performance Qualification, humbly dedicate this edition of AWS B2.1/B2.1M:2014, *Specification for Welding Procedure and Performance Qualification*, to Dr. W. D. (D'or) Doty in recognition of his long standing dedication to the committee and his efforts in the advancement of the art and science of welding. D'or was a leading member of the originating committee of this standard and was a significant force in the development of Standard Welding Procedure Specifications promoted by this standard.

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Foreword

This foreword is not part of AWS B2.1/B2.1M:2014, *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, 2005, and 2009.

This is the sixth edition of B2.1, *Specification for Welding Procedure and Performance Qualification*. This revision has undergone numerous modifications including the updating of definitions and materials; the clarification of performance qualification for partial joint penetration groove welds and tack welds, and the qualification of multiple welders on a single test weldment; the addition of NAVSEA/Mil Standards and ABS as references in the Standard Welding Procedure Specification Annex and heat input formulae for waveform controlled power sources; the correction of dimensions and deletion of conflicting examples in the guided bend fixture figures; and editorial corrections throughout the document.

A vertical line in the margin or underlined text in clauses, tables, or figures indicates an editorial or technical change from the 2009 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, 8669 NW 36 St, # 130, Miami, FL 33166.

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Specification for Welding Procedure and Performance Qualification

1. General Requirements

1.1 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 (PWHT), 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 = Electrogas 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 = Arc Stud 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.