

AWS B2.1/B2.1M:2021
An American National Standard

Specification for Welding Procedure and Performance Qualification



second printing, July 2023

**AWS B2.1/B2.1M:2021
An American National Standard**

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Specification for Welding Procedure and Performance Qualification

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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 It must be reviewed every five years, and if not revised, it must be either reaffirmed or withdrawn.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 requested 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 AWS B2 Committee dedicates the 2021 edition of B2.1/B2.1M, *Specification on Welding Procedure and Performance Qualification*, to Edward G. Yevick for his significant contribution to Welding Qualifications and Welding. A life member of AWS and a recipient of the Samuel Wylie Miller Award for outstanding efforts and contributions to welding. Mr. Yevick worked in the welding industry for 53 years. Positions in AWS held throughout his career include: Chairman of the Pittsburgh Section 1980/81, Chairman of D11 Committee on Welding Cast Iron Castings. Chairman of D14.7 Committee on Recommended Practices for Surfacing and Reconditioning of Industrial Mill Rolls. Mr. Yevick also served three terms on the AWS Technical Activity Committee (TAC). Additionally, Mr Yevick was a member and contributed to the D14, D14.1, D14.3, D14.4, D14.5, D14.6, D14.8, D14.9, B2.1, and C5 committees. In addition to his contributions to welding he was also a member of the American Society for Non-Destructive Testing for over 50 years.

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Foreword

This foreword is not part of this standard 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 numerous 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, 2009, and 2014.

This is the seventh edition of B2.1, *Specification for Welding Procedure and Performance Qualification*. This revision has undergone several modifications including the updating of definitions and materials.

A vertical line in the margin or underlined text in clauses, tables, or figures indicates an editorial or technical change from the 2014 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.

Errata

The following Errata have been identified and are incorporated in this reprint.

p. 49, 5.5.3.1: the numbering following the subclause is repeated. Change the sequence from “5.5.3.1, 5.5.3.1, 5.5.3.1” to “5.5.3.1, 5.5.3.2, 5.5.3.3.”

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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.