

AWS B2.4:2023
An American National Standard

Specification for Welding Procedure and Performance Qualification for Thermoplastics



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Specification for Welding Procedure and Performance Qualification for Thermoplastics

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Prepared by the
American Welding Society (AWS) B2 Committee on Welding 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 and welders for manual, semiautomatic, mechanized, and automatic welding. The welding processes included are electrofusion, hot gas, socket fusion, butt contact fusion, infrared, extrusion welding, flow fusion welding, and solvent cement welding. Base materials, filler materials, qualification variables, and testing requirements are also included.



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Foreword

This foreword is not part of this standard but is included for information purposes only.

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, standards, specifications, and contracts. This specification defines and establishes qualification variables. The criterion for determining if a welding condition is a procedure qualification variable is whether or not a change in that condition beyond the allowable tolerance affects the properties of a sound weld to the extent that the properties may not meet the specified minimum. Qualification requirements are based on the premise that the referencing document will specify fabrication, design, base material, filler material, pre-heat, interpass temperature, nondestructive examination, and test requirements applicable to the product. Welding procedure and performance qualifications which meet the requirements of other documents are acceptable, provided they also meet the requirements of this specification. This revision is the third edition of *Specification for Welding Procedure and Performance Qualification for Thermoplastics* and supersedes the edition published in 2012. Changes to text, figures, and tables are indicated by a vertical margin line.

Summary of Changes

Clause/Annex	Modification
Clause 1	Clause was restructured and new safety and health information was added. The thermoplastic welding processes list was modified to show applicability to pipe or pipe and sheet. New Table 1.1 lists base material names and abbreviations.
Clause 2	Normative references were changed by the removal of AWS B4.0 and the addition of ASTM F3183.
Clause 3	Introduction to the clause was changed. Individual material terms and definitions were removed.
Clause 4	Table 4.1 from the 2012 edition was replaced by new Tables 4.1A and 4.1B. Table 4.2 from the 2012 edition was removed. Table 4.3 was expanded with additional thermoplastic welding processes. Table 4.6 from the 2012 edition was redesignated as Table 4.2 and new materials were added. Table 4.7 from the 2012 edition was redesignated as Table 4.6. Figure 4.1 title and content were modified. Figure 4.2 from the 2012 edition was removed and new Figure 4.2 was added. Figure 4.3 from the 2012 edition was removed. Figures 4.4 and 4.5 from the 2012 edition were combined and redesignated as new Figure 4.3. Figures 4.6 through 4.19 from the 2012 edition were redesignated as Figures 4.4 through 4.17, respectively, and some content changes were made.
Clause 5	Table 5.1 from the 2012 edition was replaced by new Tables 5.1A and 5.1B. A new table note was added to Table 5.2. Table 5.3 from the 2012 edition was modified by the addition of abbreviations, changes to some base materials, and changes to some TPM numbers, and the table note was changed. Figure 5.1 title and content were modified.
Annex A	Table A.1 title and content were modified. Table A.2 title and content were modified. New Tables A.3 and A.4 were added.
Annex B	Sample PQTR and WPS forms were modified.
Annex C	New Annex C was added.
Annex D	New Annex D was added.
Annex E	New Annex E was added replacing Annex C from the 2012 edition.

Welding Procedure Qualification

The purpose of a welding procedure qualification is to provide test data for assessing the properties of a welded joint. The proof of production weld soundness is determined by the type and extent of testing and examination applied to the production product. Product acceptance criteria must be detailed in the referencing document. This specification also provides for welding procedure qualification of special test weldment/coupons by performing tests simulating service conditions, which may include impact loading, flexural loading, static loading, or cyclic loading. The details of testing and examination of special test weldment/coupons shall be specified by the referencing document.

Welding Performance Qualification

The purpose of welder qualification testing is to determine the ability of welders to make sound welds. Performance qualification for welders shall be determined by mechanical testing and visual examination of weldment/coupons.

Materials

Base materials and filler materials have been grouped into categories that will minimize the number of performance qualification tests required. Substitution of one base material or filler material for another, even when within the allowable rules, should only be made after an evaluation of the factors involved. For some materials, additional tests may be required. Materials not listed require separate qualification.

Comments and suggestions for the improvement of this standard are welcomed. They should be sent to the Secretary, AWS B2 Committee on Welding Qualification, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166.

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Specification for Welding Procedure and Performance Qualification for Thermoplastics

1. General Requirements

1.1 Scope. This standard provides the requirements for qualification for welding thermoplastic materials. It addresses requirements for procedure and performance qualifications. This standard is intended for use where referenced by product or fabrication code, specification, contract document, or internal documents such as quality control or quality assurance manuals. The requirements imposed by the Referencing Document supersede the requirements of this standard.

This standard is intended for use with the following thermoplastic welding processes:

- Socket Fusion Welding (SFW)¹
- Heated Tool Butt Welding (HTW)²
- Flow Fusion Welding (FFW)²
- Infrared Welding (IRW)²
- Hot Gas Welding (HGW)²
 - Speed Welding²
 - Fan Welding²
- Extrusion Welding (EXW)²
- Solvent Cement Welding (SCW)¹
- Electrofusion Welding (EFW)¹

This standard is intended for use with new construction but may be applicable for retrofit, reconstruction, or repair procedures. Thermoplastic applications that are bonded to backing materials are not addressed in this standard.

1.1.1 Materials. These guidelines apply to welded joints on components and systems made from the engineering thermoplastics shown in Table 1.1.

1.1.2 Responsibilities

1.1.2.1 Employers shall be responsible for the welding performed by their organization, including the use of the general provisions of this standard, the use of qualified welding procedures, and the use of qualified welders.

1.1.2.2 It is the employer's responsibility to assure that Welding Procedure Specifications meet all requirements of the Referencing Document.

1.1.3 Effective Date. 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; and
- (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.

¹ Welding process applies to pipe.

² Welding process applies to pipe and sheet.