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AWS B2.1-1-201:2019
An American National Standard

**Standard Welding
Procedure Specification
(SWPS) for Shielded
Metal Arc Welding of
Carbon Steel (M-1/P-1,
Group 1 or 2), 1/8 inch
[3 mm] through 3/4 inch
[19 mm] Thick, E6010
(Vertical Uphill) Followed
by E7018 (Vertical
Uphill), in the As-Welded
Condition, Primarily Pipe
Applications**

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An American National Standard

Approved by the
American National Standards Institute
March 1, 2019

Standard Welding Procedure Specification (SWPS)
for Shielded Metal Arc Welding of Carbon Steel
(M-1/P-1, Group 1 or 2), 1/8 inch [3 mm] through
3/4 inch [19 mm] Thick, E6010 (Vertical Uphill)
Followed by E7018 (Vertical Uphill), in the
As-Welded Condition, Primarily Pipe Applications

3rd Edition

Supersedes AWS B2.1-1-201-96 (R2007)

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 standard contains the essential welding variables for carbon steel in the thickness range of 1/8 inch [3 mm] through 3/4 inch [19 mm], using manual shielded metal arc welding with E6010 (vertical uphill) followed by E7018 (vertical uphill). It cites the base metals and operating conditions necessary to make the weldment, the filler metal specifications, and the allowable joint designs for fillet and groove welds. This SWPS was developed primarily for pipe applications.



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Foreword

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

The American Welding Society and the Welding Research Council have joined in a cooperative effort to generate standard welding procedures for industry. The need for pretested welding procedures that are supported by adequate test data and that satisfy the technical requirements for the commonly used construction codes and specifications has been expressed by many individuals and organizations. The purpose of a welding procedure qualification is to provide test data for assessing the properties of a weld joint.

This Standard Welding Procedure Specification is an outgrowth of the coordinated work of the Welding Procedures Committee of the Welding Research Council and the AWS B2 Committee on Procedure and Performance Qualification. The Welding Procedures Committee has provided the data documented on the Summary of Procedure Qualification Records.

The welding terms used in this specification shall be interpreted in accordance with the definitions given in the latest edition of AWS A3.0M/A3.0, *Standard Welding Terms and Definitions; Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*.

The AWS B2 Committee on Procedure and Performance Qualification was formed in 1979 to provide welding standards concerning the subject of qualification. The primary document developed by this committee is AWS B2.1/B2.1M, *Specification for Welding Procedure and Performance Qualification*. This document established the foundation and framework for Standard Welding Procedure Specifications (SWPSs). The first two SWPSs were published in 1990. Since then SWPSs are continuing to be developed and published by the American Welding Society.

All references to ASME "S" material numbers have been deleted from this edition. A Standard Units of Measure clause was added and the Safety clause was updated. Metric conversions have been updated and Annex A on requesting an official interpretation on an AWS standard is included.

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

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

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Standard Welding Procedure Specification (SWPS)

Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2), 1/8 inch [3 mm] through 3/4 inch [19 mm] Thick, E6010 (Vertical Uphill) Followed by E7018 (Vertical Uphill), in the As-Welded Condition, Primarily Pipe Applications

Welding Research Council—Supporting PQR Numbers:

001009, 001021, 003016, 003017, 103004, 106004, 106006, 107020,
200018, 200112, 200113, 200114, 200115, 200116, 200126, 200142, 200143,
200514, 200516, 200518, 200519, 200614, 200615, 200617, 200618, 200619,
200620, 200702, 200703, 500007, 500008, 500021, 500028, 500119, 001A,
002A, 197A, 198A, 199A

Requirements for Application of SWPSs

Scope. The data to support this Standard Welding Procedure Specification (SWPS) have been derived from the above listed Procedure Qualification Records (PQRs), which were reviewed and validated under the auspices of the Welding Research Council. This SWPS is not valid using conditions and variables outside the ranges listed. The American Welding Society considers that this SWPS presents information for producing an acceptable weld using the conditions and variables listed. The user needs a significant knowledge of welding and accepts full responsibility for the performance of the weld and for providing the engineering capability, qualified personnel, and proper equipment to implement this SWPS.

Application. This SWPS is to be used only as permitted by AWS B2.1/B2.1M, *Standard for Welding Procedure and Performance Qualification*, and the applicable fabrication document(s) [such as code, specification, or contract document(s)]. The fabrication document(s) should specify the engineering requirements such as design, need for heat treatment, fabricating tolerances, quality control, and examination and tests applicable to the end product.

User's Responsibility. A SWPS does not replace or substitute for fabrication codes, specifications, contract requirements, or capability and judgment on the part of the user. A SWPS is to be used only as permitted by the applicable fabrication code, specification, or contract document. The ability to produce production welds having properties suitable for the application depends upon supplementing the SWPS with appropriate performance qualification tests and sound engineering judgment. The user is responsible for the quality and performance of the final product in accordance with the provisions of the fabrication document(s).

Supplementary Instructions. To adapt this SWPS to a specific application, a user may issue supplementary instructions. Such instructions may consist of tighter fit-up tolerances, higher minimum preheat temperature or any other instructions necessary to produce a weldment that meets the requirements of the fabrication document(s). These instructions shall not be less restrictive than provided in the SWPS.

Standard Units of Measure. 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.

Safety. Safety and health issues and concerns are beyond the scope of this standard and therefore are not addressed herein. Safety and health information is available from the following sources: