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AWS-NAVSEA B2.1-1-305:2018
An American National Standard

Approved by the
American National Standards Institute
December 19, 2017

**Standard Welding Procedure Specification for
Naval Applications (SWPS-N) for 75% Argon Plus 25%
Carbon Dioxide Shielded Flux Cored Arc Welding
of Carbon Steel (S-1), 1/8 inch [3 mm] through 1-1/2 inch
[38 mm] Thick, MIL-70T-1 and MIL-71T-1, in the As-Welded
or PWHT Condition, Primarily Plate and Structural
Naval Applications**

1st Edition

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 1-1/2 inch [38 mm], using semiautomatic gas shielded flux cored arc welding. It cites the base metals and operating conditions necessary to make the weldment, the filler metal specifications, and joint designs for groove and fillet welds. This SWPS-N was developed primarily for naval applications that require performance to NAVSEA Technical Publication S9074-AQ-GIB-010/248, *Requirements for Welding and Brazing Procedure and Performance Qualification*.



American Welding Society®



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ISBN: 978-0-87171-941-6

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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 for Naval Applications is an outgrowth of the coordinated work of the Welding Procedures Committee of the Welding Research Council, the AWS B2 Committee on Procedure and Performance Qualification, and a Task Group of this committee that included the Naval Sea Systems Command (NAVSEA) and representatives of the shipbuilding industry. The Welding Procedures Committee provided the test data documented by a Summary of Procedure Qualification Records. This SWPS-N was prepared by adapting AWS B2.1-1-020 to include requirements from NAVSEA Technical Publication S9074-AQ-GIB-010/248, *Requirements for Welding and Brazing Procedure and Performance Qualification*, and other relevant fabrication documents.

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*. Welding symbols shall be those shown in the latest edition of AWS A2.4, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*. The AWS designation for welding gases should be those shown in the latest edition of AWS A5.32M/A5.32 (ISO 14175 MOD), *Welding Consumables—Gases and Gas Mixtures for Fusion Welding and Allied Processes*.

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 Task Group on Standard Welding Procedure Specifications for Naval Applications was formed in 2009 to address the need for SWPS-N documents that support the requirements of NAVSEA Technical Publication S9074-AQ-GIB-010/248 and fabrication requirements for naval applications.

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

Standard Welding Procedure Specification for Naval Applications (SWPS-N)

75% Argon Plus 25% Carbon Dioxide Shielded Flux Cored Arc Welding of Carbon Steel (S-1), 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, MIL-70T-1 and MIL-71T-1, in the As-Welded or PWHT Condition, Primarily Plate and Structural Naval Applications

Welding Research Council—Supporting PQR Numbers: 005032, 005041, 007007, 007009, 200547, 200548, 200771, 200772, 200786, 200788, 200789

Requirements for Application of SWPS-Ns

Scope. The data to support this Standard Welding Procedure Specification for Naval Applications (SWPS-N) 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-N is not valid using conditions and variables outside the ranges listed. The American Welding Society and Naval Sea Systems Command (NAVSEA) consider that this SWPS-N presents information for producing an acceptable weld using the conditions and variables listed. This procedure is intended to be used for groove and fillet welds. 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-N.

Application. This SWPS-N is to be used only as permitted by AWS B2.1/B2.1M, *Specification for Welding Procedure and Performance Qualification*, and either NAVSEA Technical Publication S9074-AQ-GIB-010/248, *Requirements for Welding and Brazing Procedure and Performance Qualification*, or American Bureau of Shipping (ABS) Naval Vessel Rules (NVR), as applicable. Restrictions on the use of SWPS-Ns specified in the following documents, if any, shall also apply.

- NAVSEA Technical Publication S9074-AR-GIB-010/278, *Requirements for Fabrication Welding and Inspection, and Casting Inspection and Repair for Machinery, Piping, and Pressure Vessels*.
- MIL-STD-1689, *Fabrication, Welding, and Inspection of Ships Structure*
- NAVSEA Technical Publication T9074-AD-GIB-010/1688, *Requirements for Fabrication, Welding, and Inspection of Submarine Structure*.

The fabrication document(s) should specify the engineering requirements such as design, need for postweld heat treatment, fabricating tolerances, quality control, and examination and tests applicable to the end product.

User's Responsibility. A SWPS-N does not replace or substitute for fabrication codes, specifications, contract requirements, or capability and judgment on the part of the user. A SWPS-N is to be used only as permitted by the applicable fabrication document, specification, or contract document. The ability to produce production welds having properties suitable for the application depends upon supplementing the SWPS-N 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).

Standard Welding Procedure Specification for Naval Applications (SWPS-N)

Supplementary Instructions. To adapt this SWPS-N 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-N.

Nomenclature Caution. The base material S numbers appearing in this standard are base material groupings used for qualification purposes in NAVSEA Technical Publication S9074-AQ-GIB-010/248 just as M numbers in AWS B2.1/B2.1M and P numbers in the ASME Pressure Vessel Code are material groupings. The S numbers in this standard are different from and not to be confused with the S number nomenclature that has been used in the ASME Pressure Vessel Code. The P number joint designations and P piping classifications in this standard have no association with the ASME P number material groupings. The A number suffix letter filler metal grouping in this standard is that included in NAVSEA Technical Publication S9074-AQ-GIB-010/248 and should not be confused with the A number weld metal groupings included in *AWS B2.1/B2.1M* or in *ASME Boiler and Pressure Vessel Code, Section IX, Welding, Brazing, and Fusing Qualifications*.

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:

American Welding Society:

- (1) ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*
- (2) AWS Safety and Health Fact Sheets
- (3) Other safety and health information on the AWS website

Material or Equipment Manufacturers:

- (1) Safety Data Sheets supplied by materials manufacturers
- (2) Operating Manuals supplied by equipment manufacturers

Applicable Regulatory Agencies:

Work performed in accordance with this standard may involve the use of materials that have been deemed hazardous, and may involve operations or equipment that may cause injury or death. This standard does not purport to address all safety and health risks that may be encountered. The user of this standard should establish an appropriate safety program to address such risks as well as to meet applicable regulatory requirements. ANSI Z49.1 should be considered when developing the safety program.