AWS D10.18M/D10.18:2008
An American National Standard

Guide for Welding Ferritic/Austenitic Duplex Stainless Steel Piping and Tubing

American Welding Society

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Guide for Welding Ferritic/Austenitic Duplex Stainless Steel Piping and Tubing

1st Edition

Prepared by the
American Welding Society (AWS) D10 Committee on Piping and Tubing

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This standard presents a detailed discussion of the metallurgical and welding characteristics and weldability of duplex stainless steel used in piping and tubing. A number of tables and graphs are presented in order to illustrate the text.

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Foreword

This foreword is not part of AWS D10.18M/D10.18:2008*, Guide for Welding Ferritic/Austenitic Duplex Stainless Steel Piping and Tubing,* but is included for informational purposes only.

This guide is intended to provide information which may be used to avoid, or at least minimize, difficulties in welding duplex stainless steel piping and tubing. The term *pipe* used in the text also includes tube.

This first edition of D10.18M/D10.18 is the first document of its kind offering a guide for welding ferritic/austenitic duplex stainless steel piping and tubing. The duplex stainless steels are finding increased use in industry and the information contained in this guide will be most useful.

Tables listing specific chemical composition ranges for base metal and weld metal that fall under the jurisdiction of other codes or documents have been omitted. Where helpful, however, comparison data is presented.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS D10 Committee on Piping and Tubing, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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1. Scope

The ferritic/austenitic duplex stainless steels (DSSs) discussed in this document have proven to be weldable using proper welding procedures. The processes GTAW, GMAW (includes all transfer modes), SMAW, FCAW, and SAW have all been used with success on these alloys. Automatic and mechanized welding such as orbital welding with the GTAW, GMAW, and FCAW processes have also been used with success on duplex alloys. Manual welders that have experience with austenitic stainless steels should be able to apply many of the techniques they have learned from these alloys to the welding of duplex stainless steels, while of course keeping in mind the exceptions to be noted within this document.

This standard makes use of both the International System of Units (SI) and U.S. Customary Units. 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.

To identify nominal pipe sizes in both SI and U.S. Customary Units, the following designations are used:

(1) DN (Diameter Nominal) is the SI designation, and

(2) NPS (Nominal Pipe Size) is the U.S. Customary designation.

Safety and health issues and concerns are beyond the scope of this standard, and therefore are not fully addressed herein. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, and applicable federal and state regulations.

2. Normative References

The following standards contain provisions which, through reference in this text, constitute mandatory provisions of this AWS guide. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

AWS A3.0, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*.[1]

3. Terms and Definitions

Terms used in this document should be interpreted in accordance with AWS A3.0, *Standard Welding Terms and Definitions*, except for those not defined by that standard or where these terms require further definition to clarify their usage in this standard.

orbital welding. Automatic or mechanized welding of tube or pipe in which a welding arc rotates (orbits) around a stationary weld joint.

4. Material Compositions and Specifications

4.1 Material Compositions. The duplex stainless steels (DSSs) have a microstructure of approximately equal parts of ferrite and austenite, consequently in the welding and fabrication, the duplex alloys exhibit some characteristics of both ferritic and austenitic stainless steels. As a result, the welding procedures for the duplex alloys require different parameters than ferritic or austenitic stainless steels.

Attractive features of DSSs include a yield strength about double that of the austenitic grades, while maintaining ductility and toughness approaching that of the austenitics. DSSs are especially resistant to chloride

[1] AWS standards are published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.