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An American National Standard

Recommended Practices for Local Heating of Welds in Piping and Tubing

American Welding Society

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Recommended Practices for Local Heating of Welds in Piping and Tubing

3rd Edition

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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 provides information on recommended practices, equipment, temperature control, insulation, and advantages and disadvantages for the methods presently available for local heating of welded joints in pipe and tubing.

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Foreword

This foreword is not part of AWS D10.10/D1010M:1999 (R2009), *Recommended Practices for Local Heating of Welds in Piping and Tubing*, but is included for informational purposes only.

This recommended practice is intended to supply useful information to those with a need to apply heat to welds in piping and tubing under circumstances that do not permit placing the entire component in a furnace or oven.

The first edition of the recommended practice prepared by the AWS Committee on Piping and Tubing was approved and published as AWS D10.10-75, *Local Heat Treatment of Welds in Piping and Tubing*.

The second edition, ANSI/AWS D10.10-90, was revised to bring the document abreast of the present "state-of-the-art," and to reemphasize certain important topics; particularly, thermocouple selection and placement, proper provision for insulation, and use of the radiant heating methods.

The present edition of D10.10 has been extensively revised to: identify/consider related domestic and international codes, standards and practices; more fully recognize the range of purposes for local heating; introduce terminology for local heating; consider the issues affecting important parameters and provide recommendations for specifying these parameters; consider both local 360-degree band and spot heating; expand the information regarding thermocouple location, attachment and accuracy; expand/update the information relating to insulation; expand the information regarding the thermal cycle; identify common process deviations and responses; introduce considerations regarding service environment; introduce quality assurance system considerations; and update and emphasize the heating methods most commonly used.

During preparation of the present edition, it was attempted to include recommendations based upon the best available, most current data regarding local heating. In most cases, the recommendations given are based upon published research, with extensive references provided. It is acknowledged that in some cases, the resulting recommendations may exceed the prevailing practice within industry, especially domestically. However, it is felt that the objective of this document is to present recommended practices based on an ordered assessment of available research and information, rather than a summary of current practice.

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.

A formal reply will be issued after it has been reviewed by the appropriate personnel following established procedures.

Table of Contents

List of Tables

List of Figures

Figure **Page No.**

Recommended Practices for Local Heating of Welds in Piping and Tubing

1. Scope

These recommended practices describe several methods of applying controlled heat to weld joints and a limited volume of base metal adjacent to the joints, as opposed to heating the complete weldment in a furnace or oven. This standard makes use of both U.S. Customary Units and the International System of Units (SI). The measurements are not exact equivalents; therefore, each system must be used independently of the other without combining values in any way. U.S. Customary Units are listed first and SI Units are listed second in parentheses ( ) when used in the text.

2. Reference Documents

Extensive reference to local heating requirements found in common piping codes, standards and practices is made to aid the user of this document. These referenced codes, standards and practices are listed below. Except for bake-out and postheating, specific hold temperature and time requirements are not discussed.

2.1 Piping Fabrication Codes

(1) *Power Piping* (ANSI/ASME B31.1), 1995 Edition, with addenda through 1997.

(2) *Process Piping* (ANSI/ASME B31.3), 1996 Edition, with addenda through 1997.

(3) *ASME Boiler and Pressure Vessel Code, Section III, Division 1—Subsection NB, Class 1 Components, Rules for Construction of Nuclear Power Plant Components*, 1998 Edition. (*Note: Although direct reference is made to Subsection NB and its related paragraphs, Subsections NC and ND for Class 2 and 3 components have essentially the same requirements.*)

(4) *British Standard Specification for Class I Arc Welding of Ferritic Steel Pipework for Carrying Fluids* (BS 2633), 1987 Edition, with Amendments to No. 2, July 1992.

2.2 Repair Codes

(1) *NBIC National Board Inspection Code* (ANSI/NB-23), 1995 Edition, with Addenda through 1996.

(2) *API Piping Inspection Code [Inspection, Repair, Alteration, and Rerating of In-Service Piping Systems]* (ANSI/API 570), June 1993 Edition, with Supplements through #1, January 1995.

2.3 Recommended Practices Regarding Service Environment

(1) *Methods and Controls to Prevent In-Service Environmental Cracking of Carbon Steel Weldments in Corrosive Petroleum Refining Environments* (NACE RP0472-95), 1995.

(2) *Avoiding Environmental Cracking in Amine Units* (ANSI/API 945), 1990.

3. Introduction

These recommended practices consider the various issues associated with local heating of welds in piping and tubing. They specifically address application of controlled heat to the weld metal, heat-affected zone (HAZ), and a limited volume of base metal adjacent to the weld, as opposed to heating the entire component (piping or tubing system) in a furnace or oven. The recommended practices generally address issues associated with circumferential butt welds. As such, primary emphasis is given to considering local 360-degree band heating. However, limited consideration of local spot heating is also provided. Although aimed at local heating, various issues common to both local and furnace heating are also discussed.