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AWS B1.11M/B1.11:2015
An American National Standard

Guide for the Visual Examination of Welds

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September 8, 2014

Guide for the Visual Examination of Welds

3rd Edition

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Prepared by the
American Welding Society (AWS) B1 Committee on Methods of Inspection

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This guide contains information to assist in the visual examination of welds. Included are sections on fundamentals, surface conditions, and equipment. Sketches and full-color photographs illustrate weld discontinuities commonly found in welds.

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Foreword

This foreword is not part of AWS B1.11M/B1.11:2015, *Guide for the Visual Examination of Welds*, but is included for informational purposes only.

Visual examination (VT), as used in this guide, is a nondestructive method whereby a weldment, the related base metal, and particular phases of welding may be evaluated in accordance with applicable requirements. All visual examination methods require the use of eyesight to evaluate the conditions which are present; hence, the term *visual* examination.

The use of gauges and other tools is supplemental to the main method, and these are treated only as adjuncts to visual examination of weldments.

The *Guide for the Visual Examination of Welds* has been prepared by the AWS B1 Committee on Methods of Inspection to serve as a simple tutorial source of basic information concerning visual examination of welds. It is not the intent of this document to present the *only* approved methods for conducting visual examination. Some typical standards are listed in this document. It is intended that the material presented be useful to engineers, designers, educators, inspectors, and other welding personnel who need knowledge about basic visual examination attributes, which would be essential, or desirable, for a particular process. Included in this guide are fundamental prerequisites for performing visual examination, steps in performing visual examination at various stages of welding, and also typical examples of visual examination, discontinuities and conditions, equipment supplements and aids, records, and other reference sources which may be helpful. Terminology used throughout this guide has been established in AWS A3.0M/A3.0, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*.

This guide is intended as an instructive reference. The codes or specifications applicable to any particular weldment always take precedence over the generalized material contained herein, should any conflict arise between the two. The text has been written in general terms and does not include all the conditions applicable to a specific instance. Examples given are general and are used only for the purpose of illustration.

This material can be used as a training text for inspectors. Although the information generally relates to the arc welding processes, most of it applies to weldments fabricated by other fusion welding processes, for which these methods may be required.

For the examination of resistance welded assemblies, refer to AWS C1.1M/C1.1, *Recommended Practices for Resistance Welding*, AWS C1.3, *Recommended Practices for Resistance Welding Coated Low Carbon Steels*, and AWS D8.7, *Recommended Practices for Automotive Weld Quality—Resistance Spot Welding*, published by the American Welding Society.

For the examination of brazed assemblies, refer to the *Brazing Handbook*, also published by the American Welding Society.

For those who need more detailed information than this guide provides, bibliographies or complete books on the subjects covered in each chapter may be found in good technical libraries. The many specifications and codes that are listed, and have been used as illustrative examples, may also be consulted for more detailed information.

Basic information on other nondestructive examination methods is contained in AWS B1.10M/B1.10, *Guide for Nondestructive Examination of Welds*, and in the *Welding Inspection Handbook*.

All revisions to the 2000 edition are identified by a vertical line in the margin next to the text.

Comments and inquiries concerning this standard are welcome. They should be sent to the Secretary, AWS B1 Committee on Methods of Inspection, American Welding Society, 8669 NW 36 St, # 130 Miami, FL 33166.

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Guide for the Visual Examination of Welds

1. General

1.1 Application. Information contained in this guide applies to the visual examination of weldments. This document is intended for those individuals that examine welds before, during, or after the weld is completed. Welders, examiners, engineers, supervisors, etc., that routinely examine welds will benefit from the information contained in this guide.

The individual examining the welds should be familiar with the principles and methods of visual examination. The qualification and certification of individuals may be required by the applicable welding standard or as a legal requirement stipulated by municipal, state, or federal statute. Current or past certification in accordance with AWS QC1, *Standard for AWS Certification of Welding Inspectors*, may be acceptable where an alternate certification scheme is not required.

Welding should not be initiated before the visual acceptance criteria are clearly defined. Clearly defined visual acceptance criteria will enable the visual examination to be effective and ensure the weldment is completed in accordance with the approved contract documents.

1.2 Scope. This guide essentially provides an introduction to visual examination of welding. These examinations fall into three categories based on the time they are performed, as follows: (1) prior to welding, (2) during welding, and (3) after welding. An extensive treatment is provided on weld surface conditions, including reference to frequently used terminologies associated with *preferred* and *non-preferred* conditions. Visual examination may be performed by different people or organizations. Personnel performing welding examination include welders, welding supervisors, the contractor's welding examiner, the purchaser's examiner, or the regulatory examiner. For the purpose of simplicity, these individuals are referred to as visual examiners in the remainder of this standard in that they perform visual examination. Fabrication documents, contract specifications, and regulatory agencies may specify who performs final examinations.

Also provided is a review of visual examination equipment routinely used, such as gauges and lighting equipment. Formal documentation of visual examination results is also discussed. Finally, the guide suggests additional reading or references, that may provide more detailed requirements for specific visual examination applications.

AWS A3.0M/A3.0 uses nondestructive examination (NDE) as the standard terminology for these examination methods. In other standards, literature, and industry usage, other expressions are commonly used. Among these are: nondestructive inspection (NDI) and nondestructive testing (NDT). It must be emphasized that all of these expressions are commonly used and may be considered equivalent.

1.2.1 Unit of Measurement. 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.

1.3 Safety and Health. 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