

**AWS B1.10M/B1.10:2009**  
**An American National Standard**



# **Guide for the Nondestructive Examination of Welds**



**American Welding Society**

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**AWS B1.10M/B1.10:2009**  
**An American National Standard**

**Approved by the**  
**American National Standards Institute**  
**July 1, 2009**

# **Guide for the** **Nondestructive Examination of Welds**

**4th Edition**

**Supersedes AWS B1.10:1999**

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 acquaints the user with the nondestructive examination methods commonly used to examine weldments. The standard also addresses which method best detects various types of discontinuities. The methods included are visual, liquid penetrant, magnetic particle, radiographic, ultrasonic, electromagnetic (eddy current), and leak testing.



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# Guide for the Nondestructive Examination of Welds

## 1. General

**1.1 Scope.** This standard provides a reference guide for the kinds of nondestructive examination methods that are used to verify that welds meet the requirements of a code or specification. The nondestructive examination methods described are:

- (1) Visual (VT)
- (2) Liquid Penetrant (PT)
- (3) Magnetic Particle (MT)
- (4) Radiographic (RT)
- (5) Ultrasonic (UT)
- (6) Electromagnetic (Eddy Current) (ET)
- (7) Leak (LT)

The types of discontinuities detected with each method are disclosed and their causes discussed. Acceptance criteria are not addressed in this standard. Requirements for nondestructive examination and acceptance criteria should be specified in procurement documents prior to the award of contracts.

Nondestructive examination (NDE) is a general term used in this text to identify the common examination methods used for evaluation of welds and related materials without destroying their usefulness.

Principal factors to consider when choosing an examination method are the advantages and limitations of the method, anticipated type and size of discontinuity, acceptance standards, and cost. Annex A is a guide to process selection.

AWS has chosen nondestructive examination (NDE) as the preferred terminology for these inspection methods. In other standards, literature, and industry usage, other expressions are commonly used. Among these are: nondestructive evaluation (NDE), 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 Advantages and Limitations of the Examination Method.** The advantages and limitations of the examination method help to determine which method(s) is (are) best for detecting discontinuities of a particular size, shape, and orientation. For example, radiography can detect discontinuities with major planes aligned parallel with the radiation beam, such as cracks oriented normal to material surfaces. Radiography, however, usually cannot detect laminations in material or cracks oriented parallel to the plate surface. Conversely, ultrasonic examination can detect cracks oriented in any direction provided the sound beam is oriented essentially perpendicular to the major axis of the crack.

**1.3 Acceptance Standards.** The statement “the weld shall be radiographically examined” is incomplete unless acceptance standards are specified. Acceptance standards define characteristics of discontinuities and state whether particular types of discontinuities are allowed. Certain discontinuities such as slag or porosity may be acceptable providing their size and distribution are within specified limits. These criteria have to be incorporated in the acceptance standards. Most codes and specifications such as AWS D1.1, *Structural Welding Code—Steel*, ASME *Boiler and Pressure Code*, and API 1104, *Welding of Pipeline and Related Facilities*, contain acceptance standards. These and other construction standards are shown in Annex C.

**1.4 Cost.** Costs of the various examination methods depend on the particular situation. Two factors that should be considered in selection of a nondestructive examination method are the cost of performing the examination and the equipment.