CarestreamNDT

WHITE PAPER

Digital transformation is not a destination but a journey.

General NDE Terms

INTRODUCTION

At Carestream NDT we want to share not only our technological developments and product portfolio, but also the knowledge and practical experience that our staff obtains by working shoulder-to-shoulder with customers like you. We aim to share this knowledge and experience in a straightforward fashion so that our readers may find practical applications in their everyday activities.

This series is directed but not limited to NDE professionals in the following industries: Oil & Gas, Nuclear, Construction, Foundry and Castings, Energy Generation, Aerospace, Transportation, Automotive, Military and Defense, Agriculture, Art Restoration & Museum Artifacts, and NDE Services Companies.

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Basic NDE Terms

Often, while we are starting our exploration of a new field or professional activity, it's imperative to understand the basic vocabulary in that discipline. This is the second in a series of support articles to facilitate your understanding of basic NDE terminology as applicable to the radiographic imaging process. Also, we are including content to differentiate between types of documents that communicate diverse NDE requirements.

This portion of the series will be beneficial, regardless if you are already involved in radiography or just interested in increasing your understanding of this field. After reading this post and gaining new insights, we welcome you to explore other articles in this series.

PART 1 Common NDE Terms

This series of basic NDE terms was obtained from ASTM E1316 "Standard Terminology for Nondestructive Examinations" and provides NDE terminology common to all NDE methods.

After reading this post and gaining new insights, we welcome you to explore other articles in this series.

PART 2 General Radiography Terms

PART 3 Film Radiography Terms

PART 4 Digital Radiography and Imaging Terms

PART 5 Image Quality and Discontinuity Indication Terms

The terms are listed in alphabetical order:

TERM	DEFINITION
acceptable quality level	The maximum percent defective or the maximum number of units defective per hundred units that, for the purpose of sampling test, can be considered satisfactory as a process average.
calibration, instrument, n	The comparison of an instrument with, or the adjustment of an instrument to, a known reference(s) often traceable to the National Institute of Standards and Technology (NIST). (See also standardization, instrument.)
cognizant engineering organization	the company, government agency or other authority responsible for the design, or end use, of the material or component for which nondestructive testing is required. *DISCUSSION — In addition to design personnel, the cognizant engineering organization could include personnel from engineering, material and process engineering, stress analysis, nondestructive testing, quality assurance and others, as appropriate.*
defect, n	One or more flaws whose aggregate size, shape, orientation, location, or properties do not meet specified acceptance criteria and are rejectable.
Digital Imaging and Communication for Nondestructive Evaluation (DICONDE)	A vendor-neutral digital data storage and transmission protocol that defines the organization of NDT image data and associated metadata in a standard electronic format. *DISCUSSION — DICONDE is based on and inherits from the universally adopted medical standard,* *DICOM, which facilitates the interoperability of imaging equipment through data storage and network communication protocols.*
discontinuity, n	A lack of continuity or cohesion; an intentional or unintentional interruption in the physical structure or configuration of a material or component.
evaluation	Determination of whether a relevant indication is cause to accept or to reject a material or component.
examination, n	a procedure for determining a property (or properties) or other conditions or characteristics of a material or component by direct or indirect means. *DISCUSSION — Examples include utilization of X-rays or ultrasonic waves for the purpose of determining (directly or by calculation) flaw content, density, or (for ultrasound) modulus; or detection of flaws by induction of eddy currents, observing thermal behavior, AE response, or utilization of magnetic particles or liquid penetrants.*
false indication, n	An NDT indication that is interpreted to be caused by a condition other than a discontinuity or imperfection.
flaw, n	An imperfection or discontinuity that may be detectable by nondestructive testing and is not necessarily rejectable.
flaw characterization, n	The process of quantifying the size, shape, orientation, location, growth, or other properties, of a flaw based on NDT response.
imperfection, n	A departure of a quality characteristic from its intended condition.
indication	The response or evidence from a nondestructive examination. *DISCUSSION — An indication is determined by interpretation to be relevant, nonrelevant, or false.*
inspection, n	See preferred term examination.

TERM	DEFINITION
interpretation, n	The determination of whether indications are relevant, nonrelevant, or false.
Nondestructive Evaluation	See Nondestructive Testing.
Nondestructive Examination	See Nondestructive Testing.
Nondestructive Inspection	See Nondestructive Testing.
Nondestructive Testing (NDT), n	The development and application of technical methods to examine materials or components in ways that do not impair future usefulness and serviceability in order to detect, locate, measure and evaluate flaws; to assess integrity, properties and composition; and to measure geometrical characteristics.
nonrelevant indication, n	An NDT indication that is caused by a condition or type of discontinuity that is not rejectable. False indications are nonrelevant.
reference standard, n	A material or object for which all relevant chemical and physical characteristics are known and measurable, used as a comparison for, or standardization of, equipment or instruments used for nondestructive testing. (See also standardization, instrument.)
relevant indication, n	An NDT indication that is caused by a condition or type of discontinuity that requires evaluation.
standard	(1) a physical reference used as a basis for comparison or calibration; (2) a concept that has been established by authority, custom, or agreement to serve as a model or rule in the measurement of quality or the establishment of a practice or procedure.
standardization, instrument, n	The adjustment of an NDT instrument using an appropriate reference standard, to obtain or establish a known and reproducible response. (This is usually done prior to an examination, but can be carried out anytime there is concern about the examination or instrument response.) (See also calibration, instrument.)
test, n	See preferred term examination.

Table 1 – General NDE Terms - Reprinted, with permission, from ASTM E1316-22, Standard Terminology for Nondestructive Examinations, copyright ASTM International. A copy of the complete standard may be obtained from https://www.astm.org/e1316-22.html.

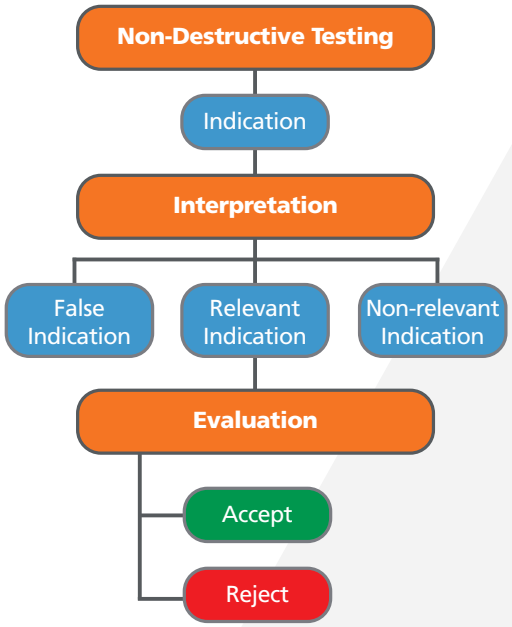

Figure 1. Interrelation of Basic NDE Terms, Adapted from ASTM E1316 – 21a, Standard Terminology for Nondestructive Examinations, [1]

Documented Requirements – Codes, regulatory requirements, standards, specifications and recommended practices

This portion of the article is based on the information available on this subject at ASNT's website (www.asnt.org).

Documented requirements are used in all aspects of construction, fabrication, manufacturing, and inspection. Following is a brief description of each of these categories along with examples of how they are used:

Codes — They are generally the top-tier documents, providing a set of rules that specify the minimum acceptable level of safety for manufactured, fabricated, or constructed objects. These may incorporate regulatory requirements and will often refer out to standards or specifications for specific details on additional requirements not specified in the Code itself. *Examples of some commonly used Codes are the ASME Boiler and Pressure Vessel Code (BPVC) and the AWS D1.1 Structural Welding Code – Steel. The BPVC covers pressure-related equipment from refineries and unfired pressure vessels to nuclear power generation, and the AWS D1.1 Code covers welded structures of all types.*

Regulations — They are generally issued by a state or federal agency when public safety is an issue. *Examples of such regulatory agencies and their regulations are the Nuclear Regulatory Commission (NRC), whose regulations are found in the Code of Federal Regulations, Title 10, Parts 0-50 (10 CFR 0-50). These regulations cover the use and handling of radioactive materials, and the NRC has significant input into Sections III and XI of the ASME BPVC, which cover new nuclear construction and in-service inspection of existing nuclear power plants. The Occupational Safety and Health Administration (OSHA) provides rules for personnel safety on job sites, and the U.S. Department of Transportation (USDOT) provides regulations for pipelines and hazardous materials in 49 CFR 100-199.*

Standards — They are documents that establish engineering or technical requirements for products, practices, methods, or operations. Of particular interest to NDT personnel are those standards that provide personnel certification requirements and those that provide requirements for performing NDT tasks. *Examples of certification standards are the ANSI/ASNT CP-189, ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel and the ANSI/ASNT CP-105, ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel. Examples of NDT performance standards are the ASTM Standard E 709, Standard Guide for Magnetic Particle Testing, and ASTM E 1444, Standard Practice for Magnetic Particle Testing.*

Specifications — They provide specific requirements for materials, components, or services and are often generated by private companies to address additional requirements applicable to a specific product or application. Specifications are often listed in procurement agreements or contract documents as additional requirements above and beyond code or standard requirements.

How you can use the information of this document in your everyday activities

For our readers interested in the explore how computed radiography (CR) and digital radiography (DR) can be integrated to your processes: **https://www.carestream.com/en/us/nondestructive-testing-ndt-solutions**

Here are some supplementary information resources from Carestream NDT's products and services portfolio:

Products:

- INDUSTREX Digital Viewing Software

Training Services:

- **Advanced Industrial Radiographic Training Academy**
  Computed Radiography - 40 Hour Online Course
  Digital Imaging - 40 Hour Classroom Training

Resources from ASNT:

- Radiographic Interpretation, Revised Edition 2020:
https://www.asnt.org/Store/ProductDetail?productKey=826c3c22-42a3-4250-9040-913d40aa0946
- Nondestructive Testing Handbook, fourth edition: Volume 3, Radiographic Testing:
https://www.asnt.org/Store/ProductDetail?productKey=83ea27b3-d68f-483d-9354-e447ef2b3915

References:

1. ASTM (2021), ASTM E1316 – 21a, Standard Terminology for Nondestructive Examinations, West Conshohocken, PA, ASTM International, 2020.
2. ASME (2021), ASME Boiler and Pressure Vessel Code - An International Code 2021 Edition, Section V Nondestructive Examination. New York: American Society of Mechanical Engineers.
3. ASNT (2021), "Codes, regulatory requirements, standards, specifications and recommended practices " Retrieved August 30, 2021 at: https://asnt.org/en/MajorSiteSections/Standards.aspx

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