CarestreamNDT

WHITE PAPER

Digital transformation is not
a destination but a journey.

Film Radiography 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.

CarestreamNDT

150 Verona Street
Rochester, NY 14608

www.carestream.com

Often, when we start to explore a new field or professional activity, it's imperative to understand the basic vocabulary in that discipline. This is the third article in a series of five devoted to facilitating your understanding of basic NDE terminology as applicable to the radiographic imaging process. This article is focused on Film Radiography Terms.

PART 1 Common NDE Terms

PART 2 General Radiography Terms

PART 3 Film Radiography Terms

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 4 Digital Radiography and Imaging Terms

PART 5 Image Quality and Discontinuity Indication Terms

Film Radiography Terms

Table 1 was obtained from Section D of ASTM E1316 and proposes a series of terminology related to film radiography, regardless if Gamma- or X-radiologic testing is performed.

The terms are listed in alphabetical order:

TERM	DEFINITION
analog image	An image produced by a continuously variable physical process (for example, exposure of film).
characteristic curve	The plot of density versus log of exposure or of relative exposure. (Also called the D-log E curve or the H and D curve.)
composite viewing	The viewing of two or more superimposed radiographs from a multiple film exposure.
densitometer	A device for measuring the optical density of radiograph film.
density (film)	See **film density.**
density comparison strip	Alternative term for **step-wedge comparison film.**
digitize (for radiology)	The act of converting an analog image or signal to a digital presentation.
film contrast	Also called gradient: a quantitative expression of the slope or steepness of the characteristic curve of a film; that property of a radiographic film material which is related to the magnitude of the density difference resulting from a given difference of the logarithmic exposure dose.
film density	The quantitative measure of diffuse optical light transmission (optical density, blackening) through a developed film. $D = \log(I_0/I)$ where: D = optical density, I_0 = light intensity incident on the film, and I = light intensity transmitted.
film speed	A numerical value expressing the response of an image receptor to the energy of penetrating radiation under specified conditions.

TERM	DEFINITION
fog	A general term used to denote any increase in optical density of a processed photographic emulsion caused by anything other than direct action of the image forming radiation and due to one or more of the following: **(a) aging** – deterioration, before or after exposure, or both, resulting from a recording medium that has been stored for too long a period of time, or other improper conditions. **(b) base** – the minimum uniform density inherent in a processed emulsion without prior exposure. **(c) chemical** – resulting from unwanted reactions during chemical processing. **(d) dichroic** – characterized by the production of colloidal silver within the developed sensitive layer. **(e) exposure** – arising from any unwanted exposure of an emulsion to ionizing radiation or light at any time between manufacture and final fixing. **(f) oxidation** – caused by exposure to air during developing. **(g) photographic** – arising solely from the properties of an emulsion and the processing conditions, for example, the total effect of inherent fog and chemical fog. **(h) threshold** – the minimum uniform density inherent in a processed emulsion without prior exposure.
fog density	A general term used to denote any increase in the optical density of a processed film caused by anything other than the direct action of the image-forming radiation.
graininess	The visual impression of irregularity of silver deposit in a processed film.
nonscreen-type film (direct-type film)	X-ray film designed for use with or without metal screens, but not intended for use with salt screens.
optical density	The degree of opacity of a translucent medium (darkening of film) expressed as follows: $D = \log(I_0/I)$ where: OD = optical density, I_0 = light intensity incident on the film, and I = light intensity transmitted through the film.
step-wedge comparison film	A processed film with defined discrete optical density steps, used to characterize the optical density on a radiograph.
transmission densitometer	An instrument that measures the intensity of the transmitted light through a radiographic film and provides a readout of the transmitted film density.
transmitted film density	The density of radiographic film determined by measuring the transmitted light.
vacuum cassette	A flexible light-tight container that, when operated under a vacuum, holds film and screen in intimate contact during a radiographic exposure.

Table 1 – Basic Film Radiography 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

How to make use of the information in this post

For readers interested in exploring our portfolio of radiographic film imaging solutions:
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 Films
- INDUSTREX Chemicals for Automatic Processing
- INDUSTREX Chemicals for Manual Processing
- INDUSTREX Eco-Friendly Chemicals
- INDUSTREX Processors

Training Services:

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

Other Carestream NDT Resources:

- Carestream NDT Virtual NDT Showcase
- Carestream NDT Resource Center

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.

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