



TESTIA

AN AIRBUS GROUP COMPANY

TESTIA-UK-TRA-RT-001-EN

Issue: 2

Date: 19/02/15

**RADIOGRAPHIC TESTING
EN4179 LEVEL 2 SYLLABUS**

SHEET 1 OF 3 SHEETS

DOCUMENT APPROVAL

Function	Name	Signature	Date
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General Theory

Instruction shall be given in the principles, limitations and theoretical aspects of the following:

- Introduction – Brief history of the development of radiographic testing, philosophy of NDT and radiographic testing capabilities in relation to other methods; Basic aerospace product technology.
- Principles of radiation – Types and sources of radiation and electromagnetic spectrum; Significance of wavelength; Sources of X and Gamma rays, their characteristics and key properties; Interaction between radiation and matter, absorption and scatter.
- Image formation; Rectilinear propagation of rays, factors affecting penumbra and inverse square law; Types and choice of film used in industrial radiography; Types and uses of screens.
- Films and processing; Photographic emulsion chemistry, development, fixation, washing and drying of film; Temperature control; Automatic and manual processing and handling faults including adventitious images.
- Fundamental aspects of radiographic quality.
- Cause, effect and control of scattered radiographic and factors that affect sensitivity, density, density measurement, contrast, speed and definition.
- Nature and properties of ionising radiation – All types briefly and then X and Gamma in-depth; Particles, wave properties, electromagnetic waves, electrical theory of matter and fundamentals of radiation physics; Interaction between penetrating radiation and matter, absorption, scatter, pair production, photoelectric effect, other secondary emission and ionising effects; Glossary of terms and units of measurement.
- Sources of radiation for radiographic inspection – Characteristics and selection of X and Gamma, basic types of X-ray generator, tube selection and uses; Isotope types, spectra, activity including self absorption and half lives.

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- Principles of radiographic image formation – Geometry of shadow projection; Use of formulae.
- Radiographic sensitometry – Characteristic curves, gradient density curves, Gamma for typical films, effect of development conditions on characteristic curve; Types and choice of film used in industrial radiography. Effect of intensifying screens (metallic, fluorometallic, salt) on exposure conditions and image quality.
- Relative merits of X and Gamma rays.

Specific Theory

Instruction shall be given in the following:

- Exposure factors; Radiation quality; Effects of changing kV; Significance and effect of types of Gamma and X ray source; Effect of time, milli-ampere and FFD on exposure; Use of exposure charts; Identification, marking out and setting up, radiographic calculations.
- Techniques – Factors influencing radiographic techniques including masking, blocking media, screens, filters and film type; The use of IQI's; Determination of focal spot size, multi-film and panoramic techniques; Assessment of depth of known defects; Causes of diffraction effects and their minimisation; An awareness of the principle of real time systems.
- Radiographic quality assessment; Judging quality of processed radiographs taking into account codes, standards, specifications, procedures and techniques; Calculation of IQI sensitivity; Methods of reporting; Use of densitometers, determination of film density; Radiographic appearance of discontinuities including adventitious images, their causes and effects; Viewing conditions; Illuminator requirements, optimum viewing conditions, masking, reduction of external lighting and viewing angle.
- Sector specific aerospace product technology theory – The depth of knowledge required will be such that the candidate will be capable of understanding the description of potential defects and their likely locations as specified in NDT instructions and procedures; Describing unambiguously in NDT reports, the nature and location of what has been found such as the non-NDT engineer can gain an accurate appreciation of the condition of the inspected area.

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Reference material

- ASNT – Study guide
- Metals Handbook Volume 17 Non-destructive evaluation of quality control
- Supplement to SNT-TC-1A as appropriate
- Non-destructive testing handbook - R McMaster
- Inspection of metals: Visual Examination. - R Anderson
- Basic Metallurgy for NDT - JL Taylor
- Radiographic testing classroom training book – ASNT
- Radiography in modern industry – Kodak

- Industrial radiography – Image forming techniques - GE