

**MAGNETIC TESTING
EN4179 LEVEL 2 SYLLABUS**

DOCUMENT APPROVAL

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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 magnetic testing, philosophy of NDT and magnetic testing capabilities in relation to other methods. Basic aerospace product technology.
- Principles of magnetic testing – Magnetisation, leakage field, attraction of ferromagnetic particles and production of indication; Requirements for magnetic testing: Component, field, flux, field strength, flux density and poles; Magnetic fields: Bar magnet, horseshoe magnet, fields produced by straight conductor and coil; Magnetic materials: Recognise terms i.e. permeability, soft and hard and a brief description of hysteresis; Magnetic currents: Description of AC, DC, HWR and FWR currents.
- Methods of magnetisation – Description of methods showing directions of current, field, flaw and calculation of magnetising current; Contact current flow; Ridged coil; Threading bar; Magnets and electromagnets; Magnetic flow.
- Inspection and detection of indications – Detecting media: Types and standard requirements: Illumination: White light, UV(A) and viewing conditions; Checks and calibrations: Reasons for checks, frequency and recordings; Sensitivity: Portable flux indicators, field strength meter and brief descriptions; Functional tests: CCF and flux flow test pieces; Equipment checks: Ammeter, illumination, detecting media and electromagnet.
- Equipment – Types of equipment: Description and correct use of portable and fixed units, electromagnets, coils and contact heads.

Specific Theory

Instruction shall be given in the following:

- Preparation for magnetic testing – Surface preparation, cleaning methods, effects of surface finish and contaminants. Contrast aid paint; Compatibility of materials.

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- Safety precautions – Fire hazards, electrical safety, ventilation, toxic materials and safe use of UV (A) radiation.
- Test procedures – Correct application of field and detecting media; Preparation and selection of magnetisation techniques to provide complete coverage with respect to geometry of specimen; Selection of current or flux values and methods of assessing sensitivity of technique.
- Detectability of defects – General advantages and limitations of the test method with regards to defect detection; Characteristics of indications; Factors affecting indications: Surface preparation, detecting medium and application.
- Interpretation and reporting – Types of discontinuity and their identification (surface and sub-surface indications); Relevant, non-relevant and false indications and their causes; Preservation of indications: Transparent tape transfer and after coating transfers, magnetic silicon rubber and photographic (fluorescent and non-fluorescent).
- Post test procedures – Demagnetisation: Reasons for, when and methods; Post test cleaning and the need for restoration of preservation coatings.

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
- Principles of Magnetic Particle testing - C Betz
- Magnetic Particle testing – A practical guide - D Lovejoy
- Classroom training handbook – Magnetic particle – General dynamics