
**Non-destructive testing — Guidelines for
NDT personnel training organizations**

*Essais non destructifs — Lignes directrices pour les organismes de
formation du personnel END*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 25108 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 138, *Non-destructive testing*, in collaboration with Technical Committee ISO/TC 135, *Non-destructive testing*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Introduction

With this Technical Report, ISO/TC 135 and CEN/TC 138 present to the worldwide non-destructive testing (NDT) community their recommendations for the minimum technical knowledge to be required of NDT personnel. These recommendations provide means for evaluating and documenting the competence of personnel whose duties demand the appropriate theoretical and practical knowledge.

As part of the efforts to streamline and harmonize the training and certification of NDT personnel, ISO/TC 135 and CEN/TC 138 have been actively involved in developing guidelines for training syllabuses (ISO/TR 25107) and for NDT training organizations (this Technical Report). These documents are intended to serve those involved in training and to be useful in achieving a uniform level of training material and — consequently — in the competence of personnel.

This document, together with ISO/TR 25107, represents two years of effort for working groups of the two technical committees in the promotion of harmonization and mutual recognition of minimum requirements taken from the different existing certification schemes.

The content of this first edition has been based on the experience of the experts as well as on comments from the end-user industries, as well as the most recent edition of the International Committee for Non-destructive testing (ICNDT) recommended guidelines.

The time allotment for the different topics takes into account the latest developments in each method and, as a consequence, the total duration can be sometimes greater than the minimum duration required by ISO 9712 and EN 473.

This Technical Report is to be revised in the coming years in order to maintain a workable document in line with the development of NDT methods and techniques.

ISO/TC 135 and CEN/TC 138 wish to express their appreciation to all those who contributed to the production of this publication.

Non-destructive testing — Guidelines for NDT personnel training organizations

1 Scope

This Technical Report gives guidelines for non-destructive testing (NDT) training organizations, with the intention of harmonizing and maintaining the general standard of training of NDT personnel for industrial needs.

It also establishes the minimum requirements for effective structured training of NDT personnel to ensure eligibility for qualification examinations leading to third-party certification according to recognized standards.

NOTE ISO/TR 25107 gives associated guidelines for NDT training syllabuses intended for the general part of training courses.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1330 (all parts), *Non-destructive testing — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1330 apply.

4 Training organization management

The training organization should appoint a person to be responsible for the overall management of the training centre and courses.

A person should also be appointed to be responsible for establishing a quality management system covering all aspects of the training services provided.

5 Quality management system

The training organization should have a suitable quality management system, e.g. ISO 9001:2000.

The system should be controlled and periodically reviewed according to the stipulations in the quality management system. The organization should

- determine the necessary competence for personnel performing work affecting the NDT training quality,
- provide training or take other actions to satisfy these needs, and
- evaluate the effectiveness of the action taken, where the competence of an individual is based on appropriate education, training, skills and experience.

6 Induction of candidates

The training organization should provide all information and conditions necessary for attendance in the training courses — for example, a system of induction could ensure that, upon receipt of an application for training, candidates are provided with unambiguous information/instructions on the following.

- Training course fees, including all that is covered by the fees, and methods of payment. There should be no hidden extras requiring further payments, and a schedule of course fees should be published.
- Dates and times for course attendance, and clear instructions concerning the location of the training venue.
- Transport (including information of parking), accommodation and catering arrangements.
- NDT equipment required to be provided by the candidate, and details of the NDT equipment provided by the training organization.
- Personal protective equipment, if required, and details of the essential safety requirements pertaining to the training venue, especially where the training course includes the use of ionizing radiation.
- Any textbooks that the student is required to provide.
- The name and contact information of a training organization representative from whom additional information can be obtained prior to or during the training course.

7 Candidate assessment

A system of ongoing assessment of candidates should be used to ensure that the learning progress of the individual candidate is monitored, and which results in counselling for those candidates that fail to achieve the required standard at any point during the course.

An appropriate evaluation according to a suitable quality management system should be carried out and a traceable statement of completion of training should be issued including the list of trainers.

8 Training syllabuses and course notes

The training organization should publish and make freely available upon request the detailed syllabuses upon which the course is based. This should include, or make reference to, the relevant syllabus associated with these guidelines.

The syllabuses should be reviewed periodically and revised, as necessary, in the light of scientific, industrial or technical developments in the NDT method or sector of application concerned, or where a change occurs in the examination syllabus associated with the qualification examination with which the course is aligned.

The training organization should maintain a master set of training course notes bearing a revision date, reviewed periodically and revised as necessary, to ensure consistency between courses in the event of staff changes.

Each candidate should be provided with a comprehensive set of appropriate course notes.

9 Facilities

The training environment should comply with all applicable health and safety legislation. Personal protective equipment should be provided if candidates are not advised to provide this for themselves.

Classrooms and practical facilities should be well lit and ventilated, and there should be adequate provision of teaching aids such as black/white boards, flip charts, overhead and digital projection and video equipment, as appropriate to the course.

10 Training specimens

Training specimens, including radiographs, should be available in sufficient quantity and complexity to cover the full range of NDT methods and techniques encompassed by the training course syllabuses.

Specimens should be available containing real or artificial discontinuities representative of those found in the field.

The position and characterization of all real or artificial discontinuities, relevant to the NDT method/technique within each specimen should be recorded on a training specimen report.

11 NDT equipment — General

Appropriate NDT equipment, including NDT instruments, accessories, calibration blocks, should be available in sufficient quantities for the number of candidates enrolled in any course (see Annex A).

There should be a documented system for maintenance and calibration of NDT equipment, including records.

12 Technical library

The NDT and product standards relevant to the courses should be available to the students.

Relevant technical publications covering the training syllabus should also be available.

Relevant certification scheme documents should be included in this library and made known to the students.

13 Training staff

There should be sufficient training staff available to ensure that a minimum of one trained and appropriately qualified tutor is present and available to candidates at all times whilst the course is in progress.

Tutors should be appropriately qualified for the NDT method and sector that the course covers, and this qualification should be at the appropriate level. Where the course provides training for level 3 candidates, the tutor should at least have relevant NDT level 3 qualification. He may be assisted by individuals holding a university degree for the physical, chemical and mathematical principles if he has not an equivalent degree.

The training organization should ensure that the tutor's NDT and product knowledge is current and maintained up to date.

14 Training records

There should be a system for raising and maintaining training records, which should be kept secure and confidential.

— Candidates' records should include

- 1) names and contact details for all candidates,
- 2) start, duration and completion dates of training,
- 3) courses attended and completed, and
- 4) trainers involved for each candidate.

— Staff records should include

- 1) background and experience,

- 2) qualifications,
- 3) certification,
- 4) formal training and updating, and
- 5) evaluation of the training by the individuals.

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Annex A (informative)

Guidelines for NDT training organization on recommended holdings

NDT equipment should be available for the full range of NDT techniques, within the scope of the NDT method and techniques being taught.

a) Ultrasonic testing:

- at least one ultrasonic flaw detector and a full range of probes appropriate to the tests, including any special purpose probes where required;
- calibration blocks and reference blocks appropriate to the tests;
- couplant.

b) Time of flight diffraction (TOFD):

- TOFD data collection instrument, including specific connecting cables for data, displayed on a computer;
- computer with compatible software to interact where necessary with the TOFD instrument and read the TOFD data;
- TOFD scanner to include probe jig and line encoder;
- pair of 5 MHz transducers with matching wedges producing centre beam refracted angles of 45°, 60° and 70°;
- appropriate calibration blocks;
- connecting cables for all parts of the equipment
- water-based couplant.

c) Radiographic testing:

- at least one X-ray tube with a kilovolt range appropriate to the materials to be tested;
- for gamma radiography (where appropriate), an Iridium 192 source, with suitable container and projection mechanism;
- an X-ray beam centring device;
- a range of image quality indicators (IQI);
- lead letters and numbers;
- blocking-off compounds and liquids;
- copper and lead filters;
- densitometer;

- film viewers, including at least one high intensity viewer;
- radiation monitor;
- stepped blocks for making exposure curves;
- calliper or other device for measuring material thickness
- separate darkrooms for film processing and film preparation/viewing;
- viewing aids, such as magnifiers;
- a manual or automatic processing unit incorporating thermostatically controlled developing tank, stop bath, rinsing, fixing and washing tanks;
- thermostatically controlled drying cabinet;
- viewer with wet film attachment;
- channel and clip type film hangers in the common sizes;
- lead and calcium tungstate screens in the common sizes;
- flexible and rigid type cassettes;
- darkroom timer;
- safelights;
- trimmer to accommodate largest size of films.

d) Eddy current testing of wrought products and welds:

- at least one standard single frequency impedance plane instrument and either one analogue meter display instrument or a corresponding digital version thereof;
- where examinations incorporate bolt hole testing, one dynamic rotating probe assembly and compatible instrument;
- where examinations are offered for multi frequency boiler tube inspection, one dual frequency impedance plane instrument suitable for testing of the examination samples held;
- absolute and differentially wound standard and shielded pencil and spade probes, suitable for testing ferritic and austenitic steels and aluminium alloys;
- selection of encircling, internal, bolthole and comparative coil types;
- calibration blocks, appropriate to all probe and material types;
- where examination of specific components, i.e. automated/semi-automated testing of steel tubes/condenser tubes, coils/probes and test equipment together with reference test pieces containing relevant holes/notches.

e) Magnetic particle testing:

- a 1 500 A bench or freestanding transformer with a.c or d.c. output (and half wave rectified a.c.) with a current flow adapter and prods, magnetic flux flow adapter and an ink reservoir with feed;
- a.c./d.c. electromagnetic yokes with articulated legs and pole pieces;
- permanent magnets with pole piece adapters suitable for all applications;
- various rigid and flexible coils, threading bars etc.;
- inspection area or Booth equipped with black out facilities for visible and UV(A) viewing of samples;
- independent or combined photometer & radiometer for measuring the intensity of visible and black light;
- demagnetising equipment;
- flux measuring and comparison gauges to standard recommendations;
- Sutherland flask or Crowe receiver for measuring solid content of magnetic ink;
- powder dispensers;
- supplies of detection media including non-fluorescent, fluorescent and dry powder;
- artificially or naturally cracked blocks/specimens for performance checking.

f) Liquid penetrant testing:

- an effective component cleaning/degreasing facility for thorough cleaning of specimens;
- a penetrant line comprising
 - i) water washable penetrant tank;
 - ii) post emulsifiable penetrant tank;
 - iii) emulsifier tank;
 - iv) water rinsing station with spray nozzle;
 - v) drying station;
 - vi) dust storm cabinet;
- aerosol liquid penetrant inspection kits comprising
 - i) penetrant remover/degreaser,
 - ii) fluorescent penetrant,
 - iii) colour contrast dye penetrant, and
 - iv) developer;
- inspection area or Booth equipped with black out facilities for visible and UV(A) viewing of samples;
- independent or combined photometer and radiometer for measuring the intensity of visible and black light;
- artificial flaws (TAM panel) or other means of process control of penetrant line.