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Non-destructive testing — Qualification and certification of NDT personnel

Essais non destructifs — Qualification et certification du personnel END

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Contents

Page

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.

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 9712 was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 7, *Personnel qualification*.

This fourth edition cancels and replaces the third edition (ISO 9712:2005), which has been technically revised.

Changes from the third edition include:

— clarification of responsibilities for the certification body, the qualification body, and the examination centre;

— redrafting of the clause “training” for clarification and change in the number of required hours;

— redrafting of the clause “experience” for clarification;

— introduction of “digital certificates”;

— other minor technical and editorial changes.

Introduction

Since the effectiveness of any application of non-destructive testing (NDT) depends upon the capabilities of the persons who perform or are responsible for the test, a procedure has been developed to provide a means of evaluating and documenting the competence of personnel whose duties require the appropriate theoretical and practical knowledge of the non-destructive tests they perform, specify, supervise, monitor or evaluate. An added incentive stems from the worldwide comparability of a wide range of industrial applications requiring common non-destructive testing approaches.

When certification of NDT personnel is required in product standards, regulations, codes or specifications, it is important to certify the personnel in accordance with this International Standard. When latitude is provided in the criteria within this International Standard, the certification body has the final decision in determining specific requirements.

When there is no requirement in legislation, in standard or in the order for certification of NDT personnel, it is for employers of such personnel to decide how to assure themselves that they are competent to do the work assignments. Thus, they may employ people who are already certified or they may apply their own expertise so as to assure themselves that their employee has the necessary competence. In this last case, prudent employers would no doubt use this International Standard as a reference document.

Non-destructive testing — Qualification and certification of NDT personnel

1 Scope

This International Standard specifies requirements for principles for the qualification and certification of personnel who perform industrial non-destructive testing (NDT).

NOTE 1 The term “industrial” implies the exclusion of applications in the field of medicine.

The system specified in this International Standard can also apply to other NDT methods or to new techniques within an established NDT method, provided a comprehensive scheme of certification exists and the method or technique is covered by International, regional or national standards or the new NDT method or technique has been demonstrated to be effective to the satisfaction of the certification body.

NOTE 2 CEN/TR 14748[5] can be used as guidance.

The certification covers proficiency in one or more of the following methods:

a) acoustic emission testing;

b) eddy current testing;

c) infrared thermographic testing;

d) leak testing (hydraulic pressure tests excluded);

e) magnetic testing;

f) penetrant testing;

g) radiographic testing;

h) strain gauge testing;

i) ultrasonic testing;

j) visual testing (direct unaided visual tests and visual tests carried out during the application of another NDT method are excluded).

NOTE 3 This International Standard specifies requirements for what are, in effect, third party conformity assessment schemes. These requirements do not directly apply to conformity assessment by second or first parties, but relevant parts of this International Standard can be referred to in such arrangements.

NOTE 4 Wherever gender specific words such as “his”, “her”, “he” or “she” appear in this International Standard, the other gender is also applicable.

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.

ISO/IEC 17024, *Conformity assessment — General requirements for bodies operating certification of persons*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
authorized qualification body
body, independent of the employer, authorized by the certification body to prepare and administer qualification examinations

3.2
basic examination
written examination, at Level 3, which demonstrates the candidate's knowledge of the materials science and process technology and types of discontinuities, the specific qualification and certification system, and the basic principles of NDT methods as required for Level 2

NOTE 1 For an explanation of the three levels of qualification, see Clause 6.

NOTE 2 The qualification and certification system is specified in this International Standard.

3.3
candidate
individual seeking qualification and certification who gains experience under the supervision of personnel having a qualification acceptable to the certification body

3.4
certificate
document issued by the certification body under specified provisions, indicating that the named person has demonstrated the competence(s) defined on the certificate

NOTE The provisions are specified in this International Standard.

3.5
certification
procedure used by the certification body to confirm that the qualification requirements for a method, level and sector have been fulfilled, leading to the issuing of a certificate

3.6
certification body
body that administers procedures for certification according to specified requirements

NOTE The requirements are specified in this International Standard.

3.7
employer
organization for which the candidate works on a regular basis

NOTE An employer can also be a candidate at the same time.

3.8
examination centre
centre approved by the certification body where qualification examinations are carried out

3.9
examiner
person certified to Level 3 in the method and product or industrial sector for which he is authorized by the certification body to conduct, supervise and grade the qualification examination

3.10
general examination
written examination, at Level 1 or Level 2, concerned with the principles of an NDT method

3.11
industrial experience
experience, acceptable to the certification body, gained under qualified supervision, in the application of the NDT method in the sector concerned, needed to acquire the skill and knowledge to fulfil the provisions of qualification

3.12
invigilator
person authorized by the certification body to supervise examinations

3.13
job-specific training
training, provided by the employer (or his agent) to the certificate holder in those aspects of non-destructive testing specific to the employer's products, NDT equipment, NDT procedures, and applicable codes, standards, specifications and procedures, leading to the award of operating authorizations

3.14
main-method examination
written examination, at Level 3, which demonstrates the candidate's general and specific knowledge, and the ability to write NDT procedures for the NDT method as applied in the industrial or product sector(s) for which certification is sought

3.15
multiple choice examination question
wording of a question giving rise to four potential replies, only one of which is correct, the remaining three being incorrect or incomplete

3.16
NDT instruction
written description of the precise steps to be followed in testing to an established standard, code, specification or NDT procedure

3.17
NDT method
discipline applying a physical principle in non-destructive testing

EXAMPLE Ultrasonic testing.

3.18
NDT procedure
written description of all essential parameters and precautions to be applied when non-destructively testing products in accordance with standard(s), code(s) or specification(s)

3.19
NDT technique
specific way of utilizing an NDT method

EXAMPLE Immersion ultrasonic testing.

3.20
NDT training
process of instruction in theory and practice in the NDT method in which certification is sought, which takes the form of training courses to a syllabus approved by the certification body

3.21
operating authorization
written statement issued by the employer, based upon the scope of certification, authorizing the individual to carry out defined tasks

NOTE Such authorization can be dependent on the provision of job-specific training.

3.22
practical examination
assessment of practical skills, in which the candidate demonstrates familiarity with, and the ability to perform, the test

3.23
qualification
demonstration of physical attributes, knowledge, skill, training and experience required to properly perform NDT tasks

3.24
qualification examination
examination, administered by the certification body or the authorized qualification body, which assesses the general, specific and practical knowledge and the skill of the candidate

3.25
qualified supervision
supervision of candidates gaining experience by NDT personnel certified in the same method under supervision or by non-certified personnel who, in the opinion of the certification body, possess the knowledge, skill, training, and experience required to properly perform such supervision

3.26
sector
particular section of industry or technology where specialized NDT practices are used, requiring specific product-related knowledge, skill, equipment or training

NOTE A sector can be interpreted to mean a product (welded products, castings) or an industry (aerospace, in-service testing). See Annex A.

3.27
significant interruption
absence or change of activity which prevents the certified individual from practising the duties corresponding to the level in the method and the sector(s) within the certified scope, for either a continuous period in excess of one year or two or more periods for a total time exceeding two years

NOTE Legal holidays or periods of sickness or courses of less than 30 days are not taken into account when calculating the interruption.

3.28
specific examination
written examination, at Level 1 or Level 2, concerned with testing techniques applied in a particular sector(s), including knowledge of the product(s) tested and of codes, standards, specifications, procedures and acceptance criteria

3.29
specification
document stating requirements

3.30
specimen
sample used in practical examinations, possibly including radiographs and data sets, which is representative of products typically tested in the applicable sector

NOTE A specimen can include more than one area or volume to be tested.

3.31
specimen master report
model answer, indicating the optimum result for a practical examination given a defined set of conditions (equipment type, settings, technique, specimen, etc.) against which the candidate's test report is graded

3.32
supervision
act of directing the application of NDT performed by other NDT personnel, which includes the control of actions involved in the preparation of the test, performance of the test and reporting of the results

3.33
validation
act of demonstrating that a verified procedure works in practice and fulfils its intended function, normally achieved by actual witnessing, demonstration, field or laboratory tests or selected trials

3.34
renewal
procedure for revalidation of a certificate without examination at any time up to five years after success in an initial, supplementary or recertification examination

3.35
recertification
procedure for revalidation of a certificate by examination or by otherwise satisfying the certification body that the published criteria for recertification are satisfied

4 Methods and abbreviated terms

For the purposes of this International Standard, the abbreviated terms listed in Table 1 are used to identify NDT methods.

Table 1 — Methods and abbreviated terms

NDT method	Abbreviated terms
Acoustic emission testing	AT
Eddy current testing	ET
Infrared thermographic testing	TT
Leak testing	LT
Magnetic testing	MT
Penetrant testing	PT
Radiographic testing	RT
Strain gauge testing	ST
Ultrasonic testing	UT
Visual testing	VT

5 Responsibilities

5.1 General

The certification system, which shall be controlled and administered by a certification body (with the assistance, where necessary, of authorized qualification bodies), includes all procedures necessary to demonstrate the qualification of an individual to carry out tasks in a specific NDT method and product or industrial sector, leading to certification of competence.

5.2 Certification body

5.2.1 The certification body shall fulfil the requirements of ISO/IEC 17024.

5.2.2 The certification body:

a) shall initiate, promote, maintain and administer the certification scheme according to ISO/IEC 17024 and this International Standard;

b) shall publish specifications for training courses that include the syllabi which embody the content of recognized documents, e.g. ISO/TR 25107[2] or equivalent;

c) may delegate, under its direct responsibility, the detailed administration of qualification to authorized qualification bodies, to which it shall issue specifications and/or procedures covering facilities, personnel, calibration and control of NDT equipment, examination materials, specimens, conduct of examinations, examination grading, records, etc.;

d) shall conduct an initial audit and subsequent periodic surveillance audits of the authorized qualification body(ies) to ensure their conformity to the specifications;

e) shall monitor, in accordance with a documented procedure, all delegated functions;

f) shall approve properly staffed and equipped examination centres which it shall monitor on a periodic basis;

g) shall establish an appropriate system for the maintenance of records, which shall be retained for at least one certification cycle (10 years);

h) shall be responsible for the issue of all certificates;

i) shall be responsible for the definition of sectors (see Annex A);

j) shall be responsible for ensuring the security of all examination materials (specimens, master reports, question banks, examination papers, etc.) and shall ensure that specimens are not in use for training purposes;

k) shall require all candidates and certificate holders to give a signed or stamped undertaking to abide by a code of ethics which it shall develop for the purpose and publish.

5.3 Authorized qualification body

5.3.1 Where established, the authorized qualification body shall:

a) work under the control of and apply the specifications issued by the certification body;

b) be independent of any single predominant interest;

c) ensure that it is impartial with respect to each candidate seeking qualification, bringing to the attention of the certification body any actual or potential threat to its impartiality;

d) apply a documented quality management system approved by the certification body;

e) have the resources and expertise necessary to establish, monitor and control examinations centres, including examinations and the calibration and control of the equipment;

f) prepare, supervise and administer examinations under the responsibility of an examiner authorized by the certification body;

g) maintain appropriate qualification and examination records according to the requirements of the certification body.

5.3.2 If there are no authorized qualification bodies, the certification body shall fulfil the requirements of the qualification body.

5.4 Examination centre

5.4.1 The examination centre shall:

a) work under the control of the certification body or authorized qualification body;

b) apply a documented quality procedure approved by the certification body;

c) have the resources needed to administer examinations, including the calibration and control of equipment;

d) have adequate qualified staff, premises and equipment to ensure satisfactory qualification examinations for the levels, methods, and sectors concerned;

e) prepare and conduct examinations under the responsibility of an examiner authorized by the certification body, using only those examination questionnaires and specimens established or approved by the certification body for that purpose;

f) use only specimens prepared or approved by the certification body or qualification body for the practical examinations conducted at that centre (when more than one examination centre exists, each shall have examination specimens of comparable test difficulty containing similar discontinuities) — under no circumstances shall specimens be used for training purposes;

g) maintain appropriate qualification and examination records according to the requirements of the certification body.

5.4.2 An examination centre can be situated at an employer's premises. In this case, the certification body shall require additional controls to preserve impartiality and the examinations shall be conducted only in the presence of, and under the control of, an authorized representative of the certification body.

5.5 Employer

5.5.1 The employer shall introduce the candidate to the certification body or the authorized qualification body and document the validity of the personal information provided. This information shall include the declaration of education, training and experience and visual acuity needed to determine the eligibility of the candidate. If the candidate is unemployed or self-employed, the declaration of education, training and experience shall be attested to by at least one independent party acceptable to the certification body.

5.5.2 Neither the employer nor his staff shall be directly involved in the qualification examination.

5.5.3 In respect of certified personnel under their control the employer shall be responsible for:

a) all that concerns the authorization to operate, i.e. providing job-specific training (if necessary);

b) issuing the written authorization to operate;

c) the results of NDT operations;

d) ensuring that the annual visual acuity requirements of 7.4 a) are met;

e) verifying continuity in the application of the NDT method without significant interruption;

f) ensuring that personnel hold valid certification relevant to their tasks within the organization;

g) maintaining appropriate records.

It is recommended that these responsibilities be described in a documented procedure.

5.5.4 A self-employed individual shall assume all responsibilities ascribed to the employer.

5.5.5 Certification to this International Standard provides an attestation of general competence of the NDT operator. It does not represent an authorization to operate, since this remains the responsibility of the employer, and the certified employee may require additional specialized knowledge of parameters such as equipment, NDT procedures, materials and products specific for the employer.

Where required by regulatory requirements and codes, the authorization to operate shall be given in writing by the employer in accordance with a quality procedure that defines any employer-required job-specific training

and examinations designed to verify the certificate holder's knowledge of relevant industry code(s), standard(s), NDT procedures, equipment, and acceptance criteria for the tested products.

5.6 Candidate

Candidates, whether employed, self-employed or unemployed shall:

a) provide documentary evidence of satisfactory completion of a course of training;

b) provide verifiable documentary evidence that the required experience has been gained under qualified supervision;

c) provide documentary evidence of vision satisfying the requirements of 7.4;

d) abide by a code of ethics published by the certification body.

5.7 Certificate holders

Certificate holders shall:

a) abide by a code of ethics published by the certification body;

b) undergo an annual test of visual acuity in accordance with 7.4 a), and submit the results of tests to the employer;

c) notify the certification body and the employer in the event that the conditions for validity of certification are not fulfilled.

6 Levels of qualification

6.1 Level 1

6.1.1 An individual certified to Level 1 has demonstrated competence to carry out NDT according to written instructions and under the supervision of Level 2 or Level 3 personnel. Within the scope of the competence defined on the certificate, Level 1 personnel may be authorized by the employer to perform the following in accordance with NDT instructions:

a) set up NDT equipment;

b) perform the tests;

c) record and classify the results of the tests according to written criteria;

d) report the results.

6.1.2 Level 1 certified personnel shall neither be responsible for the choice of test method or technique to be used, nor for the interpretation of test results.

6.2 Level 2

An individual certified to Level 2 has demonstrated competence to perform NDT according to NDT procedures. Within the scope of the competence defined on the certificate, Level 2 personnel may be authorized by the employer to:

a) select the NDT technique for the testing method to be used;

b) define the limitations of application of the testing method;

c) translate NDT codes, standards, specifications, and procedures into NDT instructions adapted to the actual working conditions;

d) set up and verify equipment settings;

e) perform and supervise tests;

f) interpret and evaluate results according to applicable standards, codes, specifications or procedures;

g) carry out and supervise all tasks at or below Level 2;

h) provide guidance for personnel at or below Level 2;

i) report the results of NDT.

6.3 Level 3

6.3.1 An individual certified to Level 3 has demonstrated competence to perform and direct NDT operations for which he is certified. Level 3 personnel have demonstrated:

a) the competence to evaluate and interpret results in terms of existing standards, codes, and specifications;

b) sufficient practical knowledge of applicable materials, fabrication, process, and product technology to select NDT methods, establish NDT techniques, and assist in establishing acceptance criteria where none are otherwise available;

c) a general familiarity with other NDT methods.

6.3.2 Within the scope of the competence defined on the certificate, Level 3 personnel may be authorized to:

a) assume full responsibility for a test facility or examination centre and staff;

b) establish, review for editorial and technical correctness, and validate NDT instructions and procedures;

c) interpret standards, codes, specifications, and procedures;

d) designate the particular test methods, procedures, and NDT instructions to be used;

e) carry out and supervise all tasks at all levels;

f) provide guidance for NDT personnel at all levels.

7 Eligibility

7.1 General

The candidate shall fulfil the minimum requirements of vision and training prior to the qualification examination and shall fulfil the minimum requirements for industrial experience prior to certification.

7.2 Training

7.2.1 The candidate shall provide documentary evidence, acceptable to the certification body, that he has satisfactorily completed training in the method and level for which the certification is sought.

7.2.2 For all levels, the candidate shall satisfactorily complete a course of theoretical and practical training recognized by the certification body.

For Level 3, in addition to the minimum training given in Table 2, the preparation for qualification can be completed in different ways dependent on the scientific and technical background of the candidate, including attendance

at other training courses, conferences or seminars, studying books, periodicals and other specialized printed or electronic materials.

NOTE Guidelines for NDT personnel training organizations are given in ISO/TR 25108.[3]

7.2.3 The minimum duration of training undertaken by the candidate for certification shall be as defined in 7.2.4 and Table 2 for the applicable NDT method, with the possible reductions defined in 7.2.5.

This duration is based upon candidates possessing adequate mathematical skills and prior knowledge of materials and processes. If it is not the case, additional training may be required by the certification body.

Training hours include both practical and theoretical courses.

When creating industrial sectors as defined in Annex A, the certification body should consider whether the minimum training requirements in Table 2 are sufficient or should be increased.

7.2.4 Direct access to Level 2 requires the total hours shown in Table 2 for Levels 1 and 2.

Direct access to Level 3 requires the total hours shown in Table 2 for Levels 1, 2, and 3. When considering the responsibilities of a certified Level 3 (see 6.3) and the content of Part C of the basic examination for Level 3 (see Table 6), additional training about the other NDT methods may be necessary.

Table 2 — Minimum training requirements

NDT method		Level 1 h	Level 2 h	Level 3 h
AT		40	64	48
ET		40	48	48
LT	B — Pressure method	24	32	32
	C — Tracer gas method	24	40	40
MT		16	24	32
PT		16	24	24
ST		16	24	20
TT		40	80	40
RT		40	80	40
UT		40	80	40
VT		16	24	24
NOTE For RT, training hours do not include radiation safety training.				

7.2.5 The possible reductions in training duration are as described hereafter, provided that, when several reductions are applicable, the total reduction does not exceed 50 % of the training duration. Any reduction requires acceptance by the certification body.

a) For all levels:

— for candidates seeking certification in more than one method (e.g. MT, PT), or for those already certified and seeking certification in another method, when the training syllabus concerned duplicates certain aspects (e.g. product technology), the total number of training hours for these methods (e.g. PT, MT, VT) may be reduced in line with the training syllabus;

— for candidates who have graduated in a relevant subject from technical college or university, or have completed at least two years of relevant engineering or science study at college or university, the total required number of training hours may be reduced by up to 50 %.

NOTE It is appropriate for the subject to be relevant to the NDT method (chemistry, mathematics or physics) and/or to the product or industry sector (chemistry, metallurgy, engineering, etc.).

b) For Levels 1 and 2, when the certification sought is limited:

— in application (e.g. automated ET, UT of bar, tube, and rod or normal beam ultrasonic thickness and lamination testing of rolled steel plate);

— in technique (e.g. RT using only radioscopy);

the training duration may be reduced by up to 50 %.

c) For direct access to Level 2 RT when certification is restricted to the film interpretation and to only one product sector, a minimum training requirement of 56 h applies.

7.3 Industrial NDT experience

7.3.1 General

The minimum duration of experience to be gained in the sector where the candidate is seeking certification shall be as given in Table 3, with the possible reductions given in 7.3.3. When the candidate is seeking certification in more than one method, the total time of experience shall be the sum of the experience in each method.

For Level 2 certification, the intent of this International Standard is that work experience consists of time as a Level 1. If the individual is being qualified directly to Level 2, with no time at Level 1, the experience shall consist of the sum of the times required for Level 1 and Level 2. No reduction in the period of experience shall be allowed.

For all levels, a minimum period of experience prior to examination shall be defined by certification body (a fraction or percentage of the total requirement in Table 3, as appropriate). In the event that a part of the experience is sought following successful examination, the results of the examination shall remain valid for two years or for the total experience time required for the methods concerned, whichever is the greater.

Documentary evidence of experience shall be confirmed by the employer and submitted to the certification body.

Table 3 — Minimum industrial experience

NDT method	Experience months[a]		
	Level 1	Level 2	Level 3
AT, ET, LT, RT, UT, TT	3	9	18
MT, PT, ST, VT	1	3	12

[a] Work experience is based on a nominal 40 h/week or the legal week of work. When an individual works in excess of 40 h/week, he may be credited with experience based on the total hours, but he shall be required to produce evidence of this experience.

7.3.2 Level 3

Level 3 responsibilities require knowledge beyond the technical scope of any specific NDT method. This broad knowledge may be acquired through a variety of combinations of education, training and experience. Table 3 details minimum experience for candidates who have successfully completed a technical school or at least two years of engineering or science study at an accredited college or university. If this is not the case, the duration has to be multiplied by a factor of 2.

For Level 3 certification, the intent of this International Standard is that work experience consists of time as a Level 2. If the individual is being qualified directly from Level 1 to Level 3, with no time at Level 2, the experience shall consist of the sum of the times required for Level 2 and Level 3. No reduction in the period of experience shall be allowed.

7.3.3 Possible reductions

7.3.3.1 The possible reductions in duration of experience are as described hereafter, provided that, when several reductions are applicable, the total reduction does not exceed 50 % of the experience duration. Any reduction does require acceptance by the certification body.

When considering possible reduction in the duration of experience, the certification body should take into consideration the following elements.

— The quality of experience can be variable, and skills may be assimilated more quickly in an environment where the experience is concentrated and has a high degree of relevance to the certification sought.

— When gaining experience simultaneously in two or more surface NDT methods, i.e. MT, PT and VT, the experience gained in the application of one NDT method may be complementary to the experience gained in one or more other surface methods.

— Experience in one sector of an NDT method for which certification is already held may be complementary to the experience in a different sector of the same NDT method.

— The level and quality of education possessed by the candidate should also be considered. This is particularly the case for the Level 3 candidate but it can also be applicable for other levels.

7.3.3.2 Credit for work experience may be gained simultaneously in two or more of the NDT methods covered by this International Standard, with the reduction of total required experience as follows:

— two testing methods: reduction of total required time by 25 %;

— three testing methods: reduction of total required time by 33 %;

— four or more testing methods: reduction of total required time by 50 %.

In all cases, the candidate shall be required to show that for each of the testing methods for which he seeks certification, he has a minimum of 50% of the time required in Table 3.

7.3.3.3 In all cases, the candidate shall be required to show that for each of the NDT method and sector combinations for which he seeks certification, he has at least half of the experience required, and this shall never be less than one month in duration.

7.3.3.4 When the certification sought is limited in application (e.g. thickness measurement or automated testing), experience duration may be reduced by up to 50 % but shall not be less than one month.

7.3.3.5 Up to 50 % of the practical experience time may be achieved by an appropriate practical course, the duration of which may be weighted by a maximum factor of 5. This procedure shall not be used in conjunction with that specified in 7.3.3.4. The course shall concentrate on practical solutions of frequently occurring testing problems and should involve a significant element of testing known defective specimens. The programme shall be approved by the certification body.

7.4 Vision requirements — all levels

The candidate shall provide documentary evidence of satisfactory vision in accordance with the following requirements:

a) near vision acuity shall permit reading a minimum of Jaeger number 1 or Times Roman N 4.5 or equivalent letters (having a height of 1,6 mm) at not less than 30 cm with one or both eyes, either corrected or uncorrected;

b) colour vision shall be sufficient that the candidate can distinguish and differentiate contrast between the colours or shades of grey used in the NDT method concerned, as specified by the employer.

The certification body may consider replacing the requirements in a) by compliance with an appropriate alternative.

Subsequent to certification, the tests of near visual acuity shall be carried out annually and verified by the employer.

8 Qualification examination

8.1 General

The qualification examination shall cover a given NDT method as applied in one industrial sector or one or more product sectors. The certification body shall define and publish the maximum amount of time allowed for the candidate to complete each examination, which shall be based upon the number and difficulty of the questions. The average time allowed for questions requiring narrative answers shall be determined by the certification body.

8.2 Examination content and grading for Level 1 and Level 2

8.2.1 General examination

The general examination shall include only questions selected in an unpredictable way from the certification body's or authorized qualification body's collection of general examination questions valid at the date of examination. The candidate shall be required, as a minimum, to give answers to the number of multiple choice questions shown in Table 4.

Where not otherwise addressed by national regulations, there shall be an additional examination on radiation safety for the radiographic test method.

Examinations on the radiographic test method may include either X- or gamma-radiation or both, depending upon the procedure of the certification body.

Table 4 — Required minimum number of questions — General examinations

NDT method	Number of questions
AT, ET, TT, RT, UT	40
LT, MT, PT, ST, VT	30

8.2.2 Specific examination

The specific examination shall include only questions selected from the certification body's or authorized qualification body's current collection of specific questions related to the sector(s) concerned.

During the specific examination, the candidate shall be required to give answers to at least 20 multiple choice questions, including questions involving calculations, NDT procedures and questions on codes, standards and specifications.

If the specific examination covers two or more sectors, the minimum number of questions shall be at least 30, evenly spread between the industrial or product sectors concerned (see Annex A).

8.2.3 Practical examination

8.2.3.1 The practical examination shall involve applying the test to prescribed specimens, recording (and, for Level 2 candidates, interpreting) the resulting information to the degree required, and reporting the results in the required format. Specimens used for training purposes shall not be used for examination.

8.2.3.2 Each specimen shall be uniquely identified and have a master report which includes all of the equipment settings used to detect specified discontinuities contained within the specimen, which shall be uniquely identified by an appropriate permanent marking to ensure that it is completely traceable. Such marking shall not interfere with the practical testing or inspection of the specimen and shall, wherever practicable, be concealed from the candidate while the specimen is being used for examination. The master report shall be

compiled based upon at least two independent tests, and shall be validated by a Level 3 certificate holder for use in grading examinations. The independent test reports from which the master report is compiled shall be retained as records.

8.2.3.3 Specimens shall be sector specific, simulating field geometries and shall contain discontinuities representative of those likely to occur during manufacturing or in service. They may be natural, artificial or implanted. For Level 2 evaluation tasks, data sets or films can be used instead of real specimens.

Specimens used for calibration or for measurement tasks (e.g. thickness or coating measurement) do not need to contain discontinuities. For RT, the specimen need not contain discontinuities since these are exhibited in the radiographs for interpretation. Similarly, for AT, TT, and ST the specimen(s) need not contain discontinuities since these are exhibited in the data sets for Level 2 interpretation.

NOTE Guidelines on discontinuity types in examination specimens can be found in CEN/TS 15053[6] or ISO/TS 22809.[1]

8.2.3.4 The certification body shall ensure that the number of areas or volumes to be tested is adequate to the level, NDT method and sector concerned, and that those areas or volumes contain reportable discontinuities. The requirements for the number of specimens and number of areas or volumes to be tested in the Level 1 and Level 2 practical examinations are given in Annex B.

8.2.3.5 The Level 1 candidate shall follow the NDT instruction(s) provided by the examiner.

8.2.3.6 The Level 2 candidate shall select the applicable NDT technique and determine the operating conditions related to a given code, standard or specification.

8.2.3.7 For those examinations where discontinuities are normally replaced by artificial sources or data, the Level 1 candidate shall demonstrate the ability to set up and calibrate the equipment, verify its sensitivity and record the test data; the Level 2 candidate shall also demonstrate the ability to interpret and evaluate previously recorded test data.

8.2.3.8 The time allowed for the examination depends on the number of specimens and on their complexity. The average time allowed shall be defined by the certification body. The recommended maximum time allowed for each area or volume tested is:

a) for Level 1: 2 h;

b) for Level 2: 3 h.

8.2.3.9 Level 2 candidates shall draft at least one NDT Instruction suitable for Level 1 personnel, for a specimen selected by the examiner.

The recommended maximum time allowed for this part of the examination is 2 h.

8.2.4 Grading of the Level 1 and Level 2 qualification examination

8.2.4.1 The general, specific and practical examinations shall be graded separately. When conventional pre-prepared paper-based examinations are used, an examiner shall be responsible for the grading of the examinations by comparison with model answers. At the option of the certification body, e-assessment systems that automatically score candidate responses against stored data and grade the completed written examination according to prepared algorithms may be used.

8.2.4.2 The grading of the practical examination shall be based on items 1 to 4 in Table 5, with the recommended weighting factors in relation to the level and method as applicable.

Table 5 — Subjects and weighting factors for grading — Practical examination

Item[a]	Subject	Weighting factor	
		Level 1	Level 2
		%	%
1	Knowledge of the NDT apparatus, including the function and verification of the setting of the apparatus.	20	10
2	The application of NDT to the specimen. This consists of the following parts: for Level 2, selection of the techniques and determination of the operating conditions; the preparation (surface condition) and visual examination of the specimen; the setting up of the apparatus; the performance of the test; the operations after the test.	35	20
3	The detection and reporting of the discontinuities and, for Level 2, their characterization (position, orientation, dimensions and type) and evaluation.	45	55
4	For Level 2, drafting the written instruction for Level 1.	—	15

[a] Table D.1 gives guidance on additional details on each item, which should be taken into account, as applicable by the examiner.

8.2.4.3 To be eligible for certification, the candidate shall obtain a minimum grade of 70 % in each part of the examination (general, specific, and practical). In addition, for the practical examination, a minimum grade of 70 % shall be obtained for each specimen tested, and for the NDT instruction, as applicable.

8.2.4.4 The general and specific parts of the examination are graded by comparing the replies given by the candidate against answer keys approved by the certification body. Each correct reply scores 1 point and the mark attributed to the tests is the sum of the points obtained. For the final calculation, the mark of each test is expressed as a percentage.

8.2.4.5 For the Level 2 candidates, the specimen for which the instruction is produced shall be graded with an overall grade of 100 in accordance with Table D.1. The other specimens (without instruction) shall be graded with an overall grade of 85 in accordance with Table D.1 (see 8.2.4.2), and the final grade shall be calculated by multiplying by 100/85. The instruction shall be graded with an overall grade of 15 in accordance with Table D.1 (see 8.2.4.2), and, for comparing with the 70 % required in 8.2.4.3, this value shall be multiplied by 100/15.

For AT, the required test instruction may relate to a specimen which is not tested during the practical examination.

8.3 Examination content and grading for Level 3

8.3.1 General

All candidates for Level 3 certification in any NDT method shall have successfully completed (with a grade of ≥70 %) the practical examination for Level 2 in the relevant sector and method, except for the drafting of NDT instructions for Level 1 (see 8.2.3.9). A candidate who is Level 2 in the same NDT method and product sector or who has successfully passed a Level 2 practical examination for the NDT method in an industrial sector, as defined in Annex A is exempt from passing again the Level 2 practical examination. This exemption is only valid for the product sectors covered by the industrial sector concerned and, in any other circumstances, the relevant sector is the sector in which the candidate seeks Level 3 certification.

8.3.2 Basic examination

8.3.2.1 This written examination shall assess the candidate's knowledge of the basic subjects using at least the number of multiple choice questions shown in Table 6. Examination questions shall be selected in an unpredictable way from the current collection of questions approved by the certification body at the time of the examination.

Table 6 — Minimum required number of basic examination questions

Part	Subject	Number of questions
A	Technical knowledge in materials science and process technology.	25
B	Knowledge of the certification body's qualification and certification system based on this International Standard. This may be an open book examination.	10
C	General knowledge of at least four methods as required for Level 2 and chosen by the candidate from the methods given in Clause 1. These four methods shall include at least one volumetric method (UT or RT).	15 for each test method (total 60)

8.3.2.2 It is recommended that the basic examination be passed first and remain valid, provided that the first main method examination is passed within five years after passing the basic examination. A candidate holding a valid Level 3 certificate is exempt from the need to retake the basic examination.

8.3.3 Main method examination

This written examination shall assess the candidate's knowledge of the main method subjects using the minimum required number of multiple choice questions shown in Table 7. Examination questions shall be selected in an unpredictable way from the current collection of questions approved by the certification body at the time of the examination.

Table 7 — Minimum required number of main method examination questions

Part	Subject	Number of questions
D	Level 3 knowledge relating to the test method applied.	30
E	Application of the NDT method in the sector concerned, including the applicable codes, standards, specifications and procedures. This may be an open book examination in relation to codes, standards, specifications and procedures.	20
F	Drafting of one or more NDT procedures in the relevant sector. The applicable codes, standards, specifications and other procedures shall be available to the candidate. For a candidate who has already drafted a NDT procedure in a successfully passed Level 3 examination, the certification body may replace the drafting of a procedure with the critical analysis of an existing NDT procedure covering the relevant method and sector, and containing errors and/or omissions.	—

8.3.4 Grading of Level 3 qualification examinations

8.3.4.1 General

The grading of the basic and main method examinations shall be done separately. To be eligible for certification, a candidate shall pass both the basic and main method examinations.

For the three parts A, B, and C of the basic examination and parts D and E of the main method, the following requirements apply.

When conventional pre-prepared paper-based examinations are used, an examiner shall be responsible for the grading of the examinations by comparing the replies given by the candidate against answer keys approved by the certification body. Each correct reply scores 1 point and the mark attributed to the tests is the sum of the points obtained. For the final calculation, the mark of each test is expressed as a percentage.

At the option of the certification body, e-assessment systems that automatically score candidate responses against stored data and grade the completed written examination according to prepared algorithms may be used.

8.3.4.2 Basic examination

In order to pass the basic examination, the candidate shall obtain a minimum grade of 70 % in each of parts A, B, and C.

8.3.4.3 Main method examination

In order to pass the main method examination, the candidate shall obtain a minimum grade of 70 % in each of parts D, E, and F.

See Table D.2 for the recommended weighting of the written examination procedure.

8.4 Conduct of examinations

8.4.1 All examinations shall be conducted in examination centres established, approved, and monitored by the certification body, either directly or through an authorized qualification body.

8.4.2 At the examination, the candidate shall have in his possession valid proof of identification and an official notification of the examination, which shall be shown to the examiner or invigilator upon demand.

8.4.3 Any candidate who, during the course of the examination, does not abide by the examination rules or who perpetrates, or is an accessory to, fraudulent conduct shall be excluded from all further qualification examinations for a period of at least one year.

8.4.4 Examination questions shall be validated by the certification body. When conventional pre-prepared paper-based examinations are used, the examination papers shall be validated and approved by an examiner, and the grading shall be done in accordance with procedures approved by the certification body (see 8.2.4 and 8.3.4). When e-assessment systems that select questions present the “written” examination to a candidate on a computer and grade the examinations, are used, the certification body shall validate and approve the e-assessment system.

8.4.5 Written (whether e-assessment or conventional) and practical qualification examinations shall be invigilated by an examiner or by one or more trained invigilators placed under an examiner’s responsibility.

8.4.6 An examiner shall not be permitted to examine any candidate:

a) that he has trained for the examination for a period of two years from the date of the conclusion of the training activities;

b) who is working (permanently or temporarily) in the same facility as the examiner.

8.4.7 With the approval of the certification body, a candidate for a practical examination may use his own equipment.

8.4.8 Candidates shall not be permitted to bring into the examination area personal items, unless specifically authorized to do so by the examiner.

8.5 Re-examination

8.5.1 A candidate failing for reasons of unethical behaviour shall wait at least 12 months before reapplying (see 8.4.3).

8.5.2 A candidate who fails to obtain the pass grade for any examination part, may be re-examined twice in the failed part(s), provided that the re-examination takes place not sooner than one month, unless further training acceptable to the certification body is satisfactorily completed, nor later than two years after the original examination.

NOTE "Examination parts" in this context refers to: for Levels 1 and 2, the general, specific, and practical examinations; for the Level 3 basic examination, Parts A, B, and C; for the Level 3 main-method examination, Parts D, E, and F.

8.5.3 A candidate failing all permitted re-examination shall apply for and take the examination in accordance with the procedure established for new candidates.

8.6 Examination exemptions

8.6.1 A certified Level 1 or Level 2 individual changing sectors or adding another sector for the same NDT method shall be required to take only the new sector specific and practical examinations for that method.

8.6.2 A certified Level 3 individual changing sectors or adding another sector for the same NDT method is exempt from the need to retake the basic examination and the Level 3 part D of the main method examination (see Table 7).

9 Certification

9.1 Administration

A candidate fulfilling all conditions shall be certified and evidence of this certification shall be made available by the certification body. This can be achieved with the issue of hard copy certificate(s) and/or wallet card(s) (see 9.2), and/or by electronically uploading and displaying the relevant information on the certification body's website.

9.2 Certificates and/or wallet cards

Certificates and/or corresponding wallet cards shall include at least:

a) the family name and forename of the certified individual;

b) the date of issue of the certification;

c) the date upon which certification expires;

d) a reference to this International Standard (ISO 9712:2012);

e) the level of certification;

f) the name of the certification body;

g) the NDT method(s);

h) the applicable sector(s);

i) if applicable, the scope of limitations to the certifications and/or the special applications;

j) a unique personal identification number;

k) the signature of the certified individual;

l) a photograph of the certified individual in the case of the wallet card;

m) a device to prevent falsification of the wallet card, e.g. use of a cold seal, welding into plastic;

n) the signature of a designated representative of the certification body.

There may be a special space on either or both the certificate and the wallet card for the signature and stamp of the employer authorizing the holder of the certificate to operate (see 3.21). With this the employer demonstrates taking responsibility for the test results.

9.3 Digital certificates

9.3.1 Digital certification may be provided in lieu of or as well as physical (hard copy) certificate(s). In this case, subject to compliance with national regulations, the following data are available without request (online, at the website of the certification body) to interested parties:

— the legal name, contact information and, where applicable, accreditation status of the certification body;

— the family name and forename of the certified individual;

— a unique personal identification number for the certified individual;

— a photographic image of the certified individual (taken within the past 10 years);

— the dates of issue and expiry of the certification;

— the scope of certification, including the level, NDT method(s), and applicable sector(s);

— any limitations to the certification, if applicable.

9.3.2 Where the data listed in 9.3.1 can be printed directly from the certification body's website, the printed output shall include a date of print and a statement that the current certification status can be verified at the relevant website.

9.4 Validity

9.4.1 General

The maximum period of validity of the certificate is five years. The period of validity shall commence (date of issue of the certification) when all of the requirements for certification (training, experience, satisfactory vision test, success in examination) are fulfilled.

Certification becomes invalid:

a) at the discretion of the certification body, e.g. after reviewing evidence of behaviour incompatible with the certification procedures or failure to abide by a code of ethics;

b) if the individual becomes physically incapable of performing his duties based upon failure of the visual acuity examination taken annually under the responsibility of his employer;

c) if a significant interruption (see 3.27) takes place in the method for which the individual is certified;

d) if the individual fails recertification, until such time as the individual meets the requirements for recertification or initial certification.

9.4.2 Revalidation

The certification body shall define the conditions for revalidation in the case of 9.4.1, a) and b).

For revalidation of the certification after a significant interruption, the individual shall pass a recertification examination. The certification is revalidated for a new period of validity of five years from the date of the revalidation.

10 Renewal

10.1 Prior to the completion of the first period of validity and every 10 years thereafter, certification may be renewed by the certification body for a new period of five years on production of:

a) documentary evidence of a satisfactory visual acuity examination taken within the preceding 12 months;

b) verifiable documentary evidence of continued satisfactory work activity without significant interruption (see 3.27) in the method and sector for which certificate renewal is sought.

If the criterion b) for renewal is not met, the individual shall follow the same rules as for recertification (see Clause 11).

10.2 It is the responsibility of the certificate holder to initiate the procedure required for renewal. The renewal files shall be presented within six months before the date of expiration of the certification. As an exception, and based upon decision of the certification body, files presented within 12 months after the date of expiration may be considered. Over this period, no exception is admitted and the candidate shall be permitted to attempt a recertification examination.

11 Recertification

11.1 General

Prior to the completion of each second period of validity (every 10 years), the certified individual may be recertified by the certification body for a new period of five years or less, provided the individual meets the criterion for renewal specified in 10.1 a) and meets the applicable conditions described in the following.

It is the responsibility of certificate holders to initiate the procedures required to obtain recertification. If the recertification is applied for more than 12 months after expiry of the period of validity, a complete examination (general, specific, and practical) for Level 1 and Level 2 and a main method examination for Level 3 shall again be passed successfully.

11.2 Level 1 and 2

11.2.1 Levels 1 and 2 certificate holders seeking recertification shall meet the criterion for renewal specified in 10.1 b) and satisfy 11.2.2.

11.2.2 The individual shall successfully complete a practical examination which demonstrates continued competence to carry out work within the scope defined on the certificate. This shall include testing specimens (see Table B.1) appropriate to the scope of certification to be revalidated and in addition, for Level 2, the production of a written instruction suitable for the use of Level 1 personnel (see 8.2.3.9). If the individual fails to achieve a grade of at least 70 % for each specimen tested (weighted according to the guidance in Table 5), and, for Level 2, for the instruction, two retests of the whole recertification examination shall be allowed after at least 7 days and within six months of the first attempt at the recertification examination.

In the event of failure in the two allowable retests, the certificate shall not be revalidated and, to regain certification for that level, sector and method, the candidate shall apply for new certification. In this case, no examination exemptions shall be awarded by virtue of any other valid certification held.

11.3 Level 3

11.3.1 Level 3 certificate holders seeking recertification shall provide evidence of continued qualification confirmed by:

a) satisfying the Level 3 requirements of 11.3.2 for a written examination;

b) meeting the requirements for a structured credit system, as given in Annex C.

The individual may decide between the examination or credit system for recertification. If the credit system is chosen and requires submission of employer's documents or access to an employer's premises, the individual shall provide to the certification body a written statement of approval from the employer.

In both cases (written examination or credit system), the individual shall either provide appropriate documented evidence, acceptable to the certification body, of his continued practical competence in the method or pass a Level 2 practical examination, as specified in 11.2.2, except for the drafting of NDT instructions.

11.3.2 The individual shall successfully complete an examination that includes a minimum of 20 questions on the application of the test method in the sector(s) concerned which demonstrates an understanding of current NDT techniques, standards, codes or specifications, and applied technology and, at the option of the certification body, five additional questions on the requirements of the certification scheme.

11.3.3 If the individual fails to achieve a grade of at least 70 % in the recertification examination, a maximum of two retests of the recertification examination shall be allowed. The time period within which all tests are to be taken shall be 12 months, unless otherwise extended by the certification body.

In the event of failure in the two allowable retests, the certificate shall not be revalidated and, to regain certification for that sector and method the candidate shall be required to achieve success in the appropriate main method examination.

11.3.4 A candidate who applies for and does not meet the requirements of the credit system shall be recertified in accordance with 11.3.2. In the event of failure at the first attempt at recertification by examination, only one retest of the recertification examination shall be allowed within 12 months of the date of application for recertification via the structured credit system.

12 Files

The certification body or its authorized qualification bodies shall maintain:

a) an actual list or database of all certified individuals classified according to level, NDT method and sector;

b) an individual file for each candidate who has not been certified, for at least five years from the date of application;

c) an individual file(s) for each certified individual and for each individual whose certification has lapsed containing:

   1) photograph or digital image taken within the past 10 years,

   2) application forms,

   3) examination documents, such as questionnaires, answers, description of specimens, records, results of test, NDT procedures, and grade sheets,

   4) renewal and recertification documents, including evidence of visual acuity and continuous activity,

   5) reason(s) for any withdrawal of certification.

Individual files shall be kept under suitable conditions of safety and confidentiality for as long as the certificate remains valid and for at least one full certification cycle after the certification has lapsed.

13 Transition period

13.1 The aim of this clause is to permit the initiation of the system when a certification body applies the certification scheme to an NDT method, which is not yet covered within its scheme or when a new sector is created. The certification body may temporarily appoint, for a period not exceeding five years from the date of implementation of the new method or sector, duly qualified personnel as examiners (see 3.9) for the purpose of conducting, supervising and grading the qualification examinations. The five year implementation period is not to be used by the certification body as a means to certify candidates who do not meet all the qualification and certification requirements of this International Standard.

13.2 Duly qualified personnel means that such personnel:

a) have the knowledge of the principles of NDT and the specific knowledge in relation to the sector;

b) have industrial experience of the application of the NDT method;

c) have the ability to conduct qualification examinations;

d) be able to interpret the questionnaire and results of qualification examinations.

13.3 Within two years of the date of appointment, these examiners shall have gained certification by satisfying the requirements for recertification as described in 11.3.1.

14 Transition between EN 473:2008,[4] ISO 9712:2005 and this International Standard

Certification according to EN 473:2008[4] and/or ISO 9712:2005, awarded before publication of this International Standard, remains valid until the next mandatory step in the certification process, i.e. renewal or recertification, which shall be carried out according to this International Standard.

Certification according to this International Standard is considered as fulfilling the requirements of both EN 473:2008 and ISO 9712:2005; consequently, any requirement for certification to either of these standards is fulfilled by a certification according to this International Standard.

Annex A
(normative)

Sectors

A.1 General

When creating a sector, the certification body may standardize according to the reference lists of sectors in A.2 and A.3. This does not preclude the development of additional sectors to satisfy national needs.

A.2 Product sectors

These include

a) castings (c) (ferrous and nonferrous materials);

b) forgings (f) (all types of forgings: ferrous and non-ferrous materials);

c) welds (w) (all types of welds, including soldering, for ferrous and non-ferrous materials);

d) tubes and pipes (t) (seamless, welded, ferrous and non-ferrous materials, including flat products for the manufacturing of welded pipes);

e) wrought products (wp) except forgings (e.g. plates, bar, rods);

f) composite materials (p).

A.3 Industrial sectors

Sectors combining a number of product sectors including all or some products or defined materials (e.g. ferrous and non-ferrous metals or non-metals like ceramics, plastics, and composites):

a) manufacturing;

b) pre- and in-service testing which includes manufacturing;

c) railway maintenance;

d) aerospace.

When creating an industrial sector, the certification body shall precisely define in its published documentation the scope of the new sector concerned in terms of product, object or item.

An individual certified in an industrial sector shall be regarded also as holding certification in the individual sectors from which the industrial sector is composed.

Sector certification may be available at all three levels of competence in all NDT methods or may be limited to particular methods or levels. However arranged, the scope of certification shall be defined on the certificate.

For composite materials, the certification body shall define the requirements for qualification examination.

Annex B
(normative)

Minimum number and type of specimens for the Level 1 and Level 2 practical examination

Table B.1 — Minimum number and type of specimens for the practical examination of Levels 1 and 2

Product sectors	Method and level															
	UT1	UT2	RT1	RT2	ET1	ET2	MT1	MT2	PT1	PT2	LT1	LT2	VT1	VT2	AT1	AT2
Castings	2	2	2	2 + 12 rs	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds
Forgings	2	2	2	2 + 12 rs	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds
Welds	2	2	2	2 + 12 rs	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds
Tubes and pipes	2	2	2	2 + 12 rs	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds
Wrought products	2	2	2	2 + 12 rs	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds
Industrial sectors (combining two or more product sectors)	**UT1**	**UT2**	**RT1**	**RT2**	**ET1**	**ET2**	**MT1**	**MT2**	**PT1**	**PT2**	**LT1**	**LT2**	**VT1**	**VT2**	**AT1**	**AT2**
Metal manufacturing	2	2	2	2 + 12 rs	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds
Pre- and in-service testing	3 c/f w	3 c/f w	2 c w	2 cw + 24 rs	3 t w	3 t w	3 c/f w	3 c/f w	3 c/f w	3 c/f w	3	3	3 c/f w	3 c/f w	1 c/f t w	1 + 2 ds c/f t w
Railway maintenance	2	2	—	—	2	2	2	2	2	2	—	—	2	2	—	—
Aerospace	3	3	2	2 + 12 rs	3	3	2	2	2	2	—	—	2	2	1	1 + 2 ds

For ST, the minimum number of specimens is 1 for Level 1 and 2 for Level 2.

For TT, the minimum number of specimens is 1 + 2 ds per industrial application.

Where the practical examination requires the testing of more than one specimen, the second or any subsequent specimens shall be different in character, e.g. in product form, material specification, shape, size, and discontinuity type, from those tested previously.

Where, after the number of specimens required, product sectors are indicated by appropriate letters, this means that specimens from these sectors shall be included in the practical examination.

For radiographic examination, Level 1 and Level 2 candidates shall radiograph at least two volumes — except for Level 2 candidates having passed a Level 1 qualification examination, where at least one volume is to be radiographed.

For leak-testing examination involving both pressure change and tracer gas, at least one specimen shall be tested for each.

Where a sector examination involves the testing of more than one product type, then the specimens tested shall be representative of all products or shall be selected at random by the examiner from the product range or materials which make up the sector.

A set of radiographs (12 or 24) shall be considered as one specimen.

Key: c ≡ casting; f ≡ forging; w ≡ weld; t ≡ tube; c/f ≡ casting or forging; rs ≡ radiographs; ds ≡ datasets

Annex C
(normative)

Structured credit system for Level 3 recertification

In this system, the Level 3 candidate gains credit for participation, during the five years prior to recertification, in the various NDT activities shown in Table C.1. Limits are placed on the maximum number of points which can be gained in each year, and in any activity over the five years, to ensure an even spread of activities.

To be eligible for recertification:

a) a minimum of 70 points shall be accrued during the five year validity of the certificate;

b) a maximum of 25 points per year are accepted.

In addition to the recertification application, the candidate shall submit evidence of satisfying the criteria of Table C.1 as follows:

— agenda and list of attendees for the meetings under items 1 to 4;

— a brief description of research and development under item 5;

— references of technical or scientific publications authored under item 5;

— a summary of training delivered under item 6;

— for each certificate, evidence of work activity per year under item 7.

Table C.1 — Structured credit system for Level 3 recertification

Item	Activity	Points accorded for each item (or function)	Maximum points per year per item	Maximum points per 5 year period per item
1	Membership of an NDT society, attendance at seminars, symposia, conferences and/or courses covering NDT and related sciences and technologies	1	3	8[a]
2.1	Attendance at international and national standardization committees	1	3	8[a]
2.2	Convenorship of standardization committees	1	3	8[ab]
3.1	Attendance at sessions of other NDT committees	1	3	8[a]
3.2	Convenorship of sessions of other NDT committees	1	3	8[ab]
4.1	Attendance at sessions of NDT related working groups	1	5	15[a]
4.2	Convenorship of NDT related working groups	1	5	15[ab]
5.1	NDT related technical/scientific contributions or publications	3	6	20[cd]
5.2	NDT related research work published	3	6	15[cd]
5.3	NDT research activity	3	6	15[cd]
6	NDT technical instructor (per 2 h) and/or NDT examiner (per examination)	1	10	30[d]
7	Professional activity	—	—	—
7.1	within a NDT facility, NDT training centre or NDT examination facility or for Engineering of NDT (see Annex E) (for each full year)	10	10	40[d]
7.2	Dealing with disputes referring to clients	1	5	15[d]
7.3	Development of NDT applications	1	5	15[d]

[a] Maximum points for items 1 to 4: 20.

[b] Points to be given for both convenorship and attendance.

[c] If there is more than one author, the lead author shall define points for the other authors.

[d] Maximum points for each of items 5 and 6: 30, and 7: 50.

Annex D
(normative)

Grading practical examination

D.1 Grading of Level 1 and Level 2 practical examination — guidance on the percentile weighting

Table D.1 — Guidance on the percentile weighting for practical examination of Levels 1 and 2

Subject	Level 1	Level 2
Part 1 — Knowledge of the NDT apparatus:		
a) system control and functional checks;	10	5
b) verification of settings.	10	5
Total	**20**	**10**
Part 2 — Application of the NDT method:		
a) preparation of the specimen (e.g. surface condition), including visual examination;	5	2
b) for Level 2, the selection of the NDT technique and determination of operating conditions;	n/a	7
c) setting up of the NDT apparatus;	15	5
d) performance of the test;	10	5
e) post test procedures (e.g. demagnetization, cleaning, preservation).	5	1
Total	**35**	**20**
Part 3 — Detection of discontinuities and reporting:[a]		
a) detection of mandatory reportable discontinuities;	20	15
b) characterization (type, position, orientation, apparent dimensions, etc.);	15	15
c) Level 2 evaluation against code, standard, specification or procedure criteria;	n/a	15
d) production of the test report.	10	10
Total	**45**	**55**
Part 4 — NDT instruction writing (Level 2 candidates):[b]		
a) foreword (scope, reference documents);	—	1
b) personnel;	—	1
c) apparatus to be used, including settings;	—	3
d) product (description or drawing, including area of interest and purpose of the test);	—	2
e) test conditions, including preparation for testing;	—	2
f) detailed instructions for application of the test;	—	3
g) recording and classifying the results of test;	—	2
h) reporting the results.	—	1
Total	—	**15**
Overall grade for practical examination	**100 %**	**100 %**
To be successful, the candidate should achieve not less than 70 % in the NDT instruction writing part, i.e. 10,5 marks out of the 15,0 marks allowed.		

[a] The candidate failing to report a discontinuity specified on the specimen master report as “mandatory for candidates to report” when performing the test under the conditions specified in the master report shall be awarded zero marks for part 3 of the practical examination relating to the specimen tested. For RT, this condition applies to radiographic interpretation, i.e. failing one “mandatory to report” discontinuity on one radiograph leads to zero marks for the set of radiographs in part 3.

[b] The Level 2 candidate is required to produce an NDT instruction, suitable for Level 1 personnel, for a specimen selected by the examiner. When the Level 2 candidate is testing a specimen for which no NDT instruction is required, the grade is calculated as a percentage of the 85 remaining marks.

D.2 Weighting of Level 3 NDT procedure examination

Table D.2 — Guidance on the percentile weighting for the Level 3 NDT procedure examination

Subject	% maximum
Part 1 — General:	
a) scope (field of application, product);	2
b) document control;	2
c) normative references and complementary information.	4
Sub-total	**8**
Part 2 — NDT personnel	**2**
Part 3 — Materials and equipment:	
a) main NDT equipment (including defining calibration status and pre-test serviceability checks);	10
b) ancillary equipment (reference and calibration blocks, consumables, measuring equipment, viewing aids, etc.).	10
Sub-total	**20**
Part 4 — Test piece:	
a) physical condition and surface preparation (temperature, access, removal of protective coatings, roughness, etc.);	1
b) description of area or volume to be tested, including reference datum;	1
c) discontinuities sought.	3
Sub-total	**5**
Part 5 — Performance of the test:	
a) NDT method(s) and technique(s) to be used;	10
b) setting up the apparatus;	10
c) conducting the test (including reference to NDT instructions);	10
d) characterization of discontinuities.	10
Sub-total	**40**
Part 6 — Acceptance criteria	**7**
Part 7 — Post test procedure:	
a) disposition of non-conforming product (labelling, segregation);	2
b) restoration of protective coatings (where required).	1
Sub-total	**3**
Part 8 — Production of the test report	**5**
Part 9 — Overall presentation	**10**
Grand total	**100**

Annex E
(informative)

Engineering of NDT

E.1 Definition

Engineering of NDT covers all the activities linked to NDT, from the design of the equipment to the responsibility of preparation, implementation and verification of NDT (in manufacturing and in service) of the same equipment belonging to industrial or technical installations.

E.2 Non-exhaustive list of activities covered

The activities covered include:

a) at design stage, definition of requirements to be taken into account and/or verification of inspectability during manufacturing and, where applicable, in service, of equipment;

b) selection of NDT techniques to be implemented in manufacturing and/or in service;

c) comparison of specific prescriptions of different codes and standards;

d) establish or validates the NDT procedures;

e) technical evaluation of NDT suppliers;

f) evaluation of NDT techniques, notably in the frame of expertise;

g) treatment (technical evaluation) of non-conformity;

h) justification to the customers and where applicable, to the associated safety authorities, of practices implemented;

i) responsibility for a NDT facility;

j) co-ordination and supervision of NDT personnel activities;

k) qualification — validation of NDT techniques:

   1) establishment of input information's including the inspection objectives,

   2) definition of the necessary mocks-up for open and, where necessary, blind tests,

   3) implementation of practical tests,

   4) preparation of technical justification including when necessary, modelling,

   5) preparation or validation of NDT procedures,

   6) preparation or validation of qualification dossiers;

l) establishment of in-service inspection programmes for industrial installations or definition of rules for the establishment of such programmes.

Bibliography

[1] ISO/TS 22809, *Non-destructive testing — Discontinuities in specimens for use in qualification examinations*

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[4] EN 473:2008, *Non-destructive testing — Qualification and certification of NDT personnel — General principles*

[5] CEN/TR 14748, *Non-destructive testing — Methodology for qualification of non-destructive tests*

[6] CEN/TS 15053, *Non-destructive testing — Recommendations for discontinuities-types in test specimens for examination*

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