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Non-destructive testing — Qualification and certification of personnel

Essais non destructifs — Qualification et certification du personnel

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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.

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 third edition cancels and replaces the second edition (ISO 9712:1999), which has been technically revised.

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 was developed to provide a means for evaluating and documenting the competence of personnel whose duties require the appropriate theoretical and practical knowledge of the non-destructive tests that they perform, specify, supervise, monitor or evaluate. An added incentive stems from the world-wide comparability of a wide range of industrial applications requiring common non-destructive testing approaches.

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

Non-destructive testing — Qualification and certification of personnel

1 Scope

This International Standard specifies the qualification and certification of personnel involved in non-destructive testing (NDT). It is applicable to proficiency in one or more of the following methods:

— acoustic emission testing;

— eddy current testing;

— infrared thermographic testing;

— leak testing (hydraulic pressure tests excluded);

— magnetic particle testing;

— penetrant testing;

— radiographic testing;

— strain testing;

— ultrasonic testing;

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

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 of the employer. Where required by regulatory requirements and codes, the authorization to operate will 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.

The system specified by this International Standard could also be applicable to other NDT methods, where independent certification programs exist.

NOTE Wherever the gender-specific word "his" or "he" appears in this International Standard, the feminine form "her" or "she" is equally 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 qualifying body
body, independent of the employer, authorized by the certification body to prepare and administer qualification examinations

3.2
candidate
individual seeking qualification and certification who gains experience under the supervision of suitably qualified personnel

3.3
certificate
document issued by the certification body under the provisions of this International Standard, indicating that the named person has demonstrated the competence(s) defined on the certificate

3.4
certification body
body that administers procedures for certification according to the requirements of 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

NOTE The issuing of a certificate does not authorize the holder to operate; this authority can only be given by the employer.

3.6
employer
organization for which the candidate works on a regular basis

3.7
examination centre
centre approved by the certification body where qualification examinations will be carried out

3.8
invigilator
person authorized by the certification body to supervise examinations

3.9
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 qualification and certification system according to this International Standard, and the basic principles of NDT methods as required for Level 2

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

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

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

3.11
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

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

3.12
practical examination
assessment of practical skills, in which the candidate demonstrates familiarity with, and the ability to perform, the test

3.13
qualification examination
examination, administered by the certification body or the authorized qualifying body, which assesses the general, specific and practical knowledge and the skill of the candidate

3.14
specific examination
written examination, at Level 1 or 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

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

3.15
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

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

3.16
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

3.17
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

3.18
job-specific training
instruction, 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

3.19
NDT instruction
written description of the precise steps to be followed in testing to an established standard, code, specification or NDT procedure

3.20
NDT method
discipline applying a physical principle in non-destructive testing

EXAMPLE Ultrasonic testing.

3.21
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)

3.22
NDT technique
specific way of utilizing an NDT method

EXAMPLE Immersion ultrasonic testing.

3.23
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, but which does not include the use of the specimens used in qualification examinations

3.24
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.

3.25
qualification
demonstration of physical attributes, knowledge, skill, training and experience required to properly perform NDT tasks

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 thirty days are not taken into account when calculating the interruption.

3.28
specification
document stating requirements

3.29
specimen
sample used in practical examinations, possibly including radiographs and data sets, preferably representative of products typically tested in the applicable sector

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

3.30
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 will be graded

3.31
qualified supervision
supervision of candidates gaining experience by NDT personnel certified to this International Standard 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

3.32
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
validate
act of demonstrating that a verified procedure will work in practice and fulfil its intended function, normally achieved by actual witnessing, demonstration, field or laboratory tests or selected trials

4 Symbols and abbreviated terms

AT	acoustic emission testing
ET	eddy current testing
TT	infrared thermographic testing
LT	leak testing
MT	magnetic particle testing
NDT	non-destructive testing
PT	penetrant testing
RT	radiographic testing
ST	strain testing
UT	ultrasonic testing
VT	visual testing

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 qualifying 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 conform to the requirements of ISO/IEC 17024. It should have no direct involvement in training of NDT personnel and be recognized by the NDT community or the ISO member body of the country concerned.

5.2.2 The certification body shall be supported by a technical committee composed of representatives of interested parties, for example: NDT societies, committees, users, suppliers and government departments as appropriate. This committee shall be responsible for setting and maintaining the technical standards of examination. Its members shall be qualified for the tasks by an appropriate combination of NDT certification and/or experience.

5.2.3 The certification body

a) shall initiate, promote, maintain and administer the certification scheme according to this International Standard,

b) shall approve properly staffed and equipped examination centres which it shall monitor,

c) may delegate, under its direct responsibility, the detailed administration of qualification to authorized qualifying bodies to which the certification body will issue specifications for facilities, personnel, equipment, examination materials, records, etc.,

d) shall conduct an initial audit, and subsequent periodic surveillance audits of the qualification bodies to ensure their conformance to the specifications,

e) shall issue all certificates,

f) shall be responsible for ensuring the security of all examination materials (specimens, master reports, question banks, examination papers, etc.),

g) shall ensure that specimens are not in use for training purposes, and

h) shall be responsible for the definition of sectors (see Annex A).

5.3 Authorized qualifying body

5.3.1 Where established, the authorized qualifying body shall

a) work under the control of the certification body,

b) 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,

c) conform to the specification issued by the certification body [see 5.2.3 c)],

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

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

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

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

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

5.4 Examination centre

5.4.1 The examination centre shall

a) work under the control of the certification body or authorized qualifying body,

b) apply a documented quality management system approved by the certification body,

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

d) prepare and conduct examinations under the responsibility of an examiner authorized by the certification body,

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

f) use only those documents and examination questionnaires established or approved by the certification body,

g) use only specimens prepared or approved by the certification body for the practical examinations conducted at that centre (when more than one examination centre exists, each shall have specimens of comparable test difficulty containing similar discontinuities), and

h) maintain appropriate records according to the requirements of the certification body.

5.4.2 An examination centre may be situated at an employer's premises. However, in this case, the certification body shall require additional controls to preserve impartiality and 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 confirm the validity of the personal information provided by the candidate to the certification body or the authorized qualifying body. This information shall include the declaration of education, training and experience 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 one or more independent parties.

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

a) be fully responsible for all that concerns the authorization to operate, including any job-specific training,

b) be responsible for the results of NDT operations,

c) ensure that the annual visual acuity requirements of 7.2.1 a) are met, and

d) verify continuity in the application of the NDT method without significant interruption.

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

6 Levels of qualification

6.1 General

An individual certified in accordance with this International Standard shall be classified in one or more of the following three levels.

6.2 Level 1

6.2.1 An individual certified to Level 1 shall have demonstrated competence to carry out NDT according to NDT 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;

d) report the results.

6.2.2 Level 1 certified personnel shall not be responsible for the choice of test method or technique to be used, nor for the assessment of test results.

6.3 Level 2

6.3.1 An individual certified to Level 2 shall have demonstrated competence to perform non-destructive testing according to established 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 test 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 codes, standards, specifications or procedures,

g) prepare NDT instructions,

h) carry out and supervise all tasks at or below Level 2,

i) provide guidance for personnel at or below Level 2, and

j) report the results of non-destructive tests.

6.4 Level 3

6.4.1 An individual certified to Level 3 shall have demonstrated competence to perform and direct non-destructive testing operations for which he is certified. Within the scope of the competence defined on the certificate, an individual certified to Level 3 may be authorized by the employer 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 codes, standards, 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, and

f) provide guidance for personnel at all levels.

6.4.2 Level 3 personnel shall have demonstrated

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

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

c) a general familiarity with other NDT methods.

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 Vision requirements — All levels

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

a) near-vision acuity shall permit reading, a minimum of Times Roman N4.5 or equivalent letters (Times New Roman of 4,5 points vertical height where 1 point = 1/72 in or 0,352 8 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 contrast between the colours used in the NDT method concerned as specified by the employer.

7.2.2 Subsequent to certification, the tests of visual acuity shall be carried out annually and be verified by the employer or the responsible agency (see 5.5.3 c)].

7.3 Training

7.3.1 The candidate for Level 1 and Level 2 certification shall provide documentary evidence, in a form acceptable to the certification body, that training in the method and level for which the certification is sought has been satisfactorily completed, in accordance with the certification body's requirements.

7.3.2 Taking into account the scientific and technical potential of candidates for Level 3 certification, preparation for qualification may be done in different ways: by attending training courses, conferences or seminars, studying books, periodicals, and other specialized printed or electronic materials. Regardless of the manner of preparation, the Level 3 candidate shall submit documentary evidence of appropriate training in a form acceptable to the certification body.

7.3.3 The minimum duration of training undertaken by the candidate for certification shall be in accordance with Table 1 for the applicable NDT method. See [1] and [2] in the Bibliography for guidance on training-course content.

Table 1 — Minimum training requirements

NDT method	Level 1 h	Level 2 Total, h (inclusive of Level 1)	Level 3 Total, h (inclusive of Level 2)
AT	40	104	150
ET	40	104	150
TT	40	120	160
LT A Basic knowledge	8	24	36
LT B Pressure method	14	45	66
LT C Tracer gas method	18	54	78
MT	16	40	60
PT	16	40	60
RT	40	120	160
ST	16	40	60
UT	40	120	160
VT	16	40	64

Training hours are based upon candidates possessing basic mathematical skills and prior knowledge of materials and processes. If this is not the case, additional training may be required by the certification body.

Training hours include both practical and theory courses.

Training duration may be reduced by up to 50 % when the certification sought is limited in application of the method.

A reduction of up to 50 % in the total required number of training hours may be accepted by the certification body for candidates who have graduated from technical college or university, or have completed at least two years of engineering or science study at college or university.

7.4 Industrial experience

7.4.1 Industrial experience may be acquired either prior to or following success in the qualification examination. Documentary evidence of experience shall be confirmed by the employer and submitted to the certification body or authorized qualifying body. In the event that the experience is sought following successful examination, the results of the examination shall remain valid for up to five years.

7.4.2 The duration of experience for each NDT method shall be in accordance with Table 2. However, a reduction in the period of experience may be permitted by the certification body, at its own discretion, taking into account the following.

a) The quality of experience gained 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.

b) 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 complimentary to the experience gained in one or more other surface NDT methods.

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

d) 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. Graduation from technical college or university, or completion of at least two years of engineering or science study at college or university, may provide justification for a reduction in experience.

Table 2 — Industrial experience

NDT Method	Experience in months (cumulative totals) [a, b, c]		
	Level 1 [d, e]	Level 2 [d, e, f] (inclusive of Level 1)	Level 3 [g] (inclusive of Level 2)
AT, ET, TT, LT, RT, UT	3	12	30
MT, PT, ST, VT	1	4	16

[a] Industrial experience in months is based on a nominal 40 h week or the legal week of work. When an individual is working 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.

[b] Credit for industrial 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 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 at least half of the time required in Table 1.

[c] In all cases the candidate shall be required to show that, for each of the NDT method/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.

[d] Experience duration may be reduced by up to 50 % (but shall not be less than one month) when the certification sought is limited in application e.g. UT thickness measurement.

[e] 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 seven (7). The course shall be concentrated on practical solutions of frequently occurring testing problems, will involve a significant element of testing known defective specimens, and the course shall be approved by the certification body.

[f] For Level 2 certification, the intent of this International Standard is that industrial experience is work performed as a Level 1.

[g] For Level 3 certification, the intent of this International Standard is that industrial experience is work performed as a Level 2. If the individual is being qualified directly to Level 3, with no time at Level 2, no reduction in the period of experience specified above shall be allowed.

8 Qualification examination — Content and grading

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. As a guide, the average time allowed should be no longer than three minutes per multiple-choice question. The average time allowed for questions requiring essay or narrative answers shall be determine by the certification body.

8.2 Examination content — Levels 1 and 2 general examination

8.2.1 The general examination shall include only questions selected in an unpredictable way from the certification body's or authorized qualifying body's current collection of general examination questions. The candidate shall be required, as a minimum, to give answers to a number of multiple-choice questions in accordance with Table 3.

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

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

Table 3 — Required minimum number of questions — Levels 1 and 2 general examination

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

8.3 Examination content — Levels 1 and 2 specific examination

8.3.1 The specific examination shall include only questions selected in an unpredictable way from the certification body's or authorized qualifying body's current collection of specific examination questions related to the sector(s) concerned. The specific examination may include questions involving calculations, and questions on codes, standards, specifications and procedures. The candidate shall be required, as a minimum, to give answers to 20 multiple-choice questions, but additional essay or narrative answer questions may also be included.

8.3.2 If the specific examination covers two or more sectors, the minimum number of questions shall be at least 30, evenly spread between the sectors concerned.

8.4 Examination content — Levels 1 and 2 practical examination

8.4.1 The practical examination shall involve applying the NDT method 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.

8.4.2 The certification body shall ensure that each specimen is uniquely identified and has a master report which includes all of the equipment settings used to detect specified discontinuities contained within the specimen. See Annex B for the requirements for specimen master reports.

8.4.3 The certification body shall ensure that each master report is compiled by at least two independent tests and that it is validated by an examiner.

8.4.4 The certification body shall ensure that specimens are sector-specific, simulating field geometries and containing discontinuities representative of those likely to occur during manufacturing or in service (inherent, processing and in-service discontinuities). Discontinuities may be natural, artificial or implanted. For RT, the specimens need not contain discontinuities, since these will be exhibited in the radiographs for Level 2 interpretation. Similarly, for AT, TT and ST the specimen(s) need not contain discontinuities, since these will be exhibited in the data sets for Level 2 interpretation. See Annex C for further information on specimens.

8.4.5 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. See Annex C for the number of areas or volumes to be tested in the Level 1 and Level 2 practical examinations.

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

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

8.4.8 The time allowed for the examination depends on the number of specimens and of their complexity. The maximum time that should be allowed for each area or volume tested is

a) 2 h for Level 1, and

b) 3 h for Level 2.

8.4.9 Level 2 candidates shall draft at least one NDT Instruction suitable for Level 1 personnel. The recommended maximum time allowed for this part of the examination is 2 h.

8.5 Examination grading — Levels 1 and 2 qualification examinations

8.5.1 An examiner shall be responsible for the grading of the examinations. The general, specific and practical examinations shall be graded separately.

8.5.2 In order to be successful in the written examination, the candidate shall obtain a minimum grade of 70 % in each of the examinations parts.

8.5.3 In order to be successful in the practical examination, the candidate shall achieve a minimum of 70 % for each specimen tested. See Annex D for guidance on the percentile weighting of the practical examination.

8.6 Examination content — Level 3

The grading of the basic and main-method examinations shall be done separately. In order, to be eligible for certification, a candidate shall have passed both the basic and main-method examinations.

8.7 Examination content — Level 3 basic examination

8.7.1 The basic examination shall include only questions selected in an unpredictable way from the certification body's or the authorized qualifying body's current collection of basic examination questions. The candidate shall be required, as a minimum, to give answers to a number of multiple-choice questions in accordance with Table 4.

Table 4 — Minimum required number of basic examination questions

Part	Subject	Number of questions
A	Technical knowledge in materials science, process technology, and types of discontinuities.	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 methods within the Scope of this International Standard. These four methods shall include at least one volumetric method (UT or RT).	15 for each test method (total 60)

8.7.2 The basic examination should be passed first and remains valid, providing that the first main-method examination is passed within five years after passing the basic examination.

8.7.3 In order to be successful in this examination, the candidate shall achieve a minimum of 70 % in each of the three Parts (A, B and C).

8.8 Examination content — Level 3 main-method examination

8.8.1 The main-method examination shall include only questions selected in an unpredictable way from the certification body's or authorized qualifying body's current collection of main-method examination questions. The candidate shall be required, as a minimum, to give answers to the number of multiple-choice questions shown in Table 5.

8.8.2 All candidates for the Level 3 main-method examination shall have successfully completed the practical examination for Level 2, graded in accordance with 8.5.3, in the appropriate sector and method, including the drafting of practical instructions for Level 1 (see 8.4.9).

8.8.3 In order to pass the main-method examination, a candidate shall obtain a minimum grade of 70 % in each Part (D, E or F).

Table 5 — Minimum required number of main-method examination questions

Part	Subject	Number of questions
D	Level 3 knowledge relating to the test method.	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 procedures shall be available to the candidate. See Annex E for guidance on the percentile weighting of the NDT procedure examination. For a candidate who has already drafted an NDT procedure in a 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.	—

9 Qualification examination — Conduct

9.1 General

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

9.1.2 Before commencement of the examination, the candidate shall present to the examiner or invigilator valid proof of identification.

9.1.3 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 further examinations for a period of one year.

9.1.4 Examinations shall be approved by an examiner. The examination shall be invigilated and evaluated by an examiner, or by one or more invigilators placed under the examiner's responsibility.

9.1.5 An examiner shall be responsible for grading the examination in accordance with procedures established or approved by the certification body. An examiner shall not be permitted to examine any candidate that he has trained for the examination, or who has the same employer as the candidate.

9.1.6 With the approval of the certification body, a candidate for a practical examination may use his own NDT apparatus.

9.2 Re-examination

9.2.1 A candidate who fails to obtain the pass grade required for certification may be re-examined in any of the examination parts twice, provided that the re-examinations take place not sooner than 30 days after a previous examination and not later than five years after the original examination. A certification body may use its discretion in allowing an earlier re-examination in the event that further training acceptable to the certification body is undertaken.

NOTE *Examination parts* in this context refers to, for the general examination, specific examination, practical examination and basic examination, Parts A, B and C, and for the main-method examination, Parts D, E and F.

9.2.2 A candidate failing the second re-examination may apply for and — if accepted — shall take the examination in accordance with the procedure established for new candidates.

9.3 Examination exemptions

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

9.3.2 A certified Level 3 individual changing sectors, or adding another sector in the same NDT method, need not retake the basic examination nor the Level 3 knowledge relating to the test method (Part D in Table 5) of the main-method examination.

10 Certification

10.1 Administration

A candidate fulfilling all conditions for certification shall be issued with a certificate and/or corresponding wallet card by the certification body.

10.2 Certificates and/or wallet cards

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

a) the full name of the certified individual,

b) the date of certification,

c) the date upon which certification expires,

d) the level of certification,

e) the name of the certification body,

f) the NDT method(s),

g) applicable sector(s),

h) a unique personal identification number,

i) the signature of the certified individual,

j) a photograph of the certified individual in the case of the wallet card,

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

l) the signature, on the certificate, of a designated representative of the certification body.

A special space may be left on either or both the certificate and the wallet card for a statement of limitations and for the signature and stamp of the employer authorizing the holder of the certificate to operate and taking responsibility for test results.

10.3 Validity

10.3.1 The period of validity shall not exceed five years from the date of certification indicated on the certificate and/or wallet card.

10.3.2 Certification shall be invalid

a) at the option of the certification body after reviewing evidence of unethical behaviour,

b) if the individual fails to meet the visual acuity requirements of 7.2.1 a),

c) if a significant interruption takes place in the individual's work within the scope of the certificate until such time as the individual meets requirements for recertification, or

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

10.4 Renewal

10.4.1 Prior to the completion of the first period of validity, certification may be renewed by the certification body for a new period of similar duration, provided the certificate holder supplies documentary evidence of

a) satisfactorily fulfilling, during the preceding 12 months, the vision requirements of 7.2.1 a), and

b) continued satisfactory work activity, relevant to the certification, without significant interruption.

10.4.2 If the criterion 10.4.1 b) for renewal is not met, the individual shall follow the same rules as for recertification (see 10.5).

10.5 Recertification

10.5.1 General

Prior to completion of each second period of validity, or at least every ten years, the certified individual may be recertified by the certification body for a similar period, provided the individual meets the criterion 10.4.1 a) for renewal and meets the following conditions, as applicable.

10.5.2 Levels 1 and 2

The individual shall successfully complete a practical examination that assesses ongoing competence to carry out work within the scope of the certificate, according to the following.

a) See Annex D for guidance on the subjects to be covered and their percentile weighting in the practical examination. If the individual fails to achieve a grade of at least 70 % for each specimen tested, two retests of the recertification examination shall be allowed within 12 months of the first attempt at the recertification examination.

b) In the event of failure in the two allowable retests, the individual shall not be recertified and, in order to regain certification for that level, sector and method, the individual shall apply for new certification. If the individual holds valid certification in a different sector of the same method, an exemption in the general examination will be allowed.

10.5.3 Level 3

10.5.3.1 The individual shall provide evidence of continued qualification confirmed by

a) satisfying the Level 2 requirements of 10.5.2 for a practical examination as well as the (Level 3) requirements of 10.5.3.2 for a written examination, or

b) meeting the requirements of 10.5.3.3 for a structured credit system (if such a system is available in the certification scheme).

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.

10.5.3.2 Successful completion of a written examination administered by the certification body.

a) 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 demonstrating an understanding of current standards, codes or specifications, and applied technology. If the individual fails to achieve a grade of at least 70 % in the recertification examination, two retests of the recertification examination shall be allowed within 12 months — unless otherwise approved by the certification body — of the first attempt at recertification.

b) In the event of failure in the two allowable retests, the individual shall not be recertified and, to regain certification for that sector and method shall be required to achieve success in the appropriate main-method examination.

10.5.3.3 Successful completion of the requirements of a structured-credit system, where offered by the certification body, in accordance with Annex F. An individual who applies for and does not meet the requirements of the credit system shall recertify in accordance with 10.5.3.1 a). 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.

11 Files

11.1 The certification body or its authorized qualifying bodies shall be responsible for maintaining

a) updated list of all certified individuals classified according to level, NDT method and sector,

b) a separate file for each candidate who has not been certified, for at least five years from the date of application, and

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

— application forms,

— examination documents such as questionnaires, answers, description of specimens, records, results of test, written procedures and grade sheets,

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

— reasons for any withdrawal of certification.

11.2 Files shall be kept under suitable conditions of safety and confidentiality for as long as the certification remains valid and for at least one full certification cycle after a lapse of certification.

12 Introduction of new NDT methods or sectors

12.1 For a new certification scheme, or when a new NDT method or new sector is added to an existing certification scheme, the certification body may temporarily appoint, during a period not exceeding three years from the date of implementation of the new scheme or method/sector, duly qualified personnel as examiners for the purpose of conducting, supervising and grading the qualification examinations. The three-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.

12.2 Duly qualified personnel shall

a) have the knowledge of the principles of NDT and the specific knowledge relation to the industry sector,

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

c) have the ability to conduct examinations, and

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

12.3 Within two years of the date of appointment, these examiners shall have gained certification by satisfying the requirements for recertification given in 10.5.2.

Annex A
(informative)

Sectors

When creating a sector, the certification body may standardize according to the following list. This does not preclude the development of additional sectors to satisfy national needs.

a) Product sectors

Comprising the following:

1) castings (ferrous and non-ferrous materials);

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

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

4) tube and pipe (seamless, welded, ferrous and non-ferrous materials, including flat products for the manufacture of welded pipes);

5) wrought products, except forgings (plates, bar, rods).

b) Industrial sectors

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

1) manufacturing;

2) pre and in-service testing, which includes manufacturing;

3) railway maintenance;

4) aerospace.

When creating an industrial sector, the certification body shall precisely define in its published documentation the products covered.

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

Industry 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 should be defined on the certificate.

Annex B
(normative)

Specimen master report

Each specimen master report shall be compiled and validated by an examiner from at least two independent reports from tests carried out by appropriately certified Level 2 or Level 3 personnel with at least two years experience in the application of the NDT method for which the specimen is to be used.

The independent test reports from which the master report is compiled shall be retained as records.

It is not necessary for the master report to be signed by the persons carrying out the independent tests, as the reports will be retained, but the master report shall be signed and dated by an examiner.

The report shall contain at least the following information:

a) name and logo of certification body;

b) specimen identification number;

c) type of product;

d) material;

e) dimensions;

f) for use with specified NDT methods/techniques;

g) NDT procedure (apparatus, calibration/settings, operating conditions);

h) discontinuities contained;

i) discontinuities which shall be reported by the candidate (mandatory);

j) compiled from independent tests conducted by (identification of two testing personnel);

k) validation by examiner (name, signature, unique personal identification number issued by the certification body) on (date).

Annex C
(normative)

Level 1 and 2 specimens

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

Product sector	Method/Level																			
	UT1	UT2	RT1	RT2	ET1	ET2	MT1	MT2	PT1	PT2	LT1	LT2	VT1	VT2	AT1	AT2	ST1	ST2	TT1	TT2
Castings	2	2	2	2 + 12 rs	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds	1	2	1 + 2 ds	1 + 2 ds
Forgings	2	2	—	—	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds	1	2	1 + 2 ds	1 + 2 ds
Welds	2	2	2	2 + 12 rs	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds	1	2	1 + 2 ds	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	1	2	1 + 2 ds	1 + 2 ds
Wrought products	2	2	—	—	2	2	2	2	2	2	2	2	2	2	1	1 + 2 ds	1	2	1 + 2 ds	1 + 2 ds

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

For RT examination, Level 1 and Level 2 candidates shall radiograph at least two volumes — except for Level 2 candidates holding Level 1 certification, where at least one volume shall be radiographed.

For LT examination involving both pressure change and tracer gas, at least one volume shall be tested for each.

For AT examinations, the discontinuities may be replaced by artificial sources. The Level 1 candidate shall demonstrate the ability to install the equipment, verify its sensitivity and record the test data. The Level 2 candidate shall also demonstrate the ability to interpret and evaluate at least two sets of previously recorded test data.

Industrial sectors (which include two or more products)

The practical examination shall include not less than three tests of separate areas or volumes.

The specimens tested shall be representative of all products, or shall be selected at random by the examiner from the product range which makes up the sector.

For radiographic film interpretation, the number of radiographs interpreted shall be not less than eight for each relevant product sector encompassed by an industrial sector.

NOTE For guidance on specimens, see [3] in the Bibliography.

rs radiographs
ds data sets

Annex D
(informative)

Weighting of Level 1 and 2 practical examinations

Guidance on percentile weighting		
Subject	**Level 1 %**	**Level 2 %**
Part 1: Knowledge of NDT apparatus		
a) System control and functional checks	10	5
b) Verification of settings	10	5
Total	20	10
Part 2: Application of 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: Writing of NDT instruction (Level 2 candidates) [b]		
a) Foreword (scope, reference documents), status and authorization		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 [c]		15
Overall grade for practical specimen	**100**	**100**

[a] A candidate failing to report a discontinuity specified on the specimen master report as "mandatory for candidates to report" when performing the test in the conditions specified in the master report is awarded zero marks for Part 3 of the practical examination related to the specimen tested.

[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.

[c] In order 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.

Annex E
(informative)

Weighting of Level 3 NDT procedure examination

Guidance on percentile weighting	
Subject	**% max.**
Part 1: General	
a) Scope (field of application, product)	2
b) Document control	2
c) Normative references and complementary information	4
Subtotal	8
Part 2: NDT personnel	2
Part 3: Material required to conduct test	
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
Subtotal	20
Part 4: Test piece	
a) Physical condition & 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
Subtotal	5
Part 5: Performance of 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
Subtotal	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
Subtotal	3
Part 8: Production of test report	5
Part 9: Overall presentation	10
Total	**100**

Annex F
(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 below. Limits are placed on the maximum number of points that can be gained in each year, and in any activity over the five years, to ensure an even spread of activities.

Item	Activity	Points accorded for each item (or function)	Max. points per year per item	Min. points per 5 year period per item	Max. 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	—	10
2.1	Participation in and contribution to meetings of NDT related working groups or committees	1	8	—	20
2.2	Convenorship of meetings of NDT related working groups or committees	1	8	—	20
3	NDT related research or technical/scientific contributions to publications	3	6	—	30
4	Conduct of NDT training (per 2 hours) and/or NDT examinations (per examination)	1	10	—	30
5	Responsibility within an NDT facility, NDT training centre or NDT examination facility (for each full year)	10	10	—	50
6	Professional development with an examination component	10	20	20 [a]	30

To be eligible for recertification, a minimum of 70 points shall be accrued during the five year validity of the certificate, while a maximum of 25 points per year shall be accepted.

In addition to the recertification application, the candidate shall submit evidence of satisfying the criteria of Table G1 as follows.

— Verifiable evidence of NDT society membership or of attendance at relevant event described under item 1.

— Agenda and list of attendees for the meetings under items 2.1 and 2.2.

— A brief description of the research and development and/or a copy of the technical or scientific publication under item 3. If there is more than one author, the lead author shall define points for the other authors.

— A summary of training and/or examinations delivered under item 4.

— For each certificate, evidence of work activity per year under item 5.

— For each certificate, documentary evidence of successful practical testing under item 6. The examination component consists of successful practical testing of a relevant specimen at an examination centre approved by the certification body. Ten points may be claimed per specimen successfully tested.

[a] Not applicable when the Level 3 certificate holder concurrently holds a Level 2 certificate with the same scope.

Bibliography

[1] ANSI/ASNT CP-189:2001, *American National Standard for Qualification and Certification of Non-destructive Testing Personnel*, Appendix B, Training Outlines and References. American Society for Non-destructive Testing Inc., P.O. Box 28518, Columbus, OH 43228-0518 USA, Tel.: (+1) 614-274-6003, Fax.: (+1) 614-274-6899

[2] IAEA-TECDOC-628/Rev.1:2002, *Training Guidelines in Non-destructive Testing Techniques*. INIS Clearinghouse, International Atomic Energy Agency, P.O. Box 100, Wagramer Strasse 5, A-1400 Vienna, Austria, Tel.: (+43) 1 2600 22880 or 222866, Fax.: (+43) 1 2600 29882; e-mail: chouse@iaea.org

[3] EFNDT/S/02, *Specification for Practical Examination Specimens*. European Certification Process (ECP) document, issue 1 rev. E 23, September 2001. European Federation for Non-Destructive Testing (EFNDT) Secretariat at BINDT, 1 Spencer Parade, NN1 5AA Northampton (United Kingdom). e-mail: enquiries@bindt.org; web: http://www.bindt.org

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