BS ISO 11484:2009

BSI Standards Publication

Steel products — Employer's qualification system for non-destructive testing (NDT) personnel

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National foreword

This British Standard is the UK implementation of ISO 11484:2009. It supersedes BS EN 10256:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/110, Steel Tubes, and Iron and Steel Fittings.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Steel products — Employer's qualification system for non-destructive testing (NDT) personnel

Produits en acier — Système de qualification, par l'employeur, du personnel pour essais non destructifs (END)

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Foreword

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

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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 11484 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 19, *Technical delivery conditions for steel tubes for pressure purposes*.

This second edition cancels and replaces the first edition (ISO 11484:1994), which has been technically revised.

Introduction

This International Standard concerns the qualification of personnel engaged in non-destructive testing (NDT) of steel products.

It has been recognized that, within the steel industry worldwide, there is a predominance of semi-automatic/automatic NDT equipment in use by NDT personnel to establish product integrity, as opposed to principally manual methods adopted in other industrial sectors. As a result, this International Standard permits employer qualification, subject to certain restrictions.

In the preparation of this International Standard, the requirements of ISO 9712 have been taken into account or adopted where they apply. However, it should be noted that the primary job-specific nature of the NDT tasks performed by NDT personnel on steel products is clearly outside the scope of ISO 9712 (see 3.13 of ISO 9712:2005).

Thus, in the context of this International Standard, the requirements of ISO 9712 should not be taken as basic or additional minimum requirements, but this does not preclude the right of any individual to apply for and obtain qualification/certification in conformance with ISO 9712, as may be appropriate in another sector.

It is recognized that this International Standard may be applied to steel products and other specific product areas, as appropriate.

Steel products — Employer's qualification system for non-destructive testing (NDT) personnel

1 Scope

1.1 This International Standard describes an employer's qualification system for non-destructive testing (NDT) personnel performing the inspection of the following steel products under the employer's responsibility:

— tubes/pipes (seamless or welded);

— flat products, long products, rails, bars, sections, rod, wire.

1.2 This International Standard describes qualification requirements for Level 1 and Level 2 of NDT personnel competence to execute specific tasks in the NDT of steel products. The qualification is issued by the employer for a specific product and a specific method.

1.3 This International Standard is intended to apply to NDT personnel performing predominantly automated inspection of steel products, using any of the following NDT methods:

a) eddy current testing (ET);

b) flux leakage testing (FT);

c) leak testing (LT);

d) liquid penetrant testing (PT);

e) magnetic particle testing (MT);

f) radiographic testing (RT);

g) ultrasonic testing (UT);

h) visual inspection testing (VT).

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 9712, *Non-destructive testing — Qualification and certification of personnel*

3 Terms and definitions

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

3.1
qualification
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

[ISO 9712:2005]

3.2
qualifying body
body or department, independent from that of production, authorized by the employer to undertake the preparation and administration of examinations

NOTE The qualifying body can also be an external organization operating under the mandate of the employer.

3.3
employer
organization for which the candidate works on a regular basis

[ISO 9712:2005]

3.4
candidate
individual seeking qualification

3.5
set-up
mechanical and/or electronic adjustment of NDT equipment to establish the testing parameters and testing sensitivity required by the product specification

3.6
NDT method
discipline applying a physical principle in non-destructive testing

[ISO 9712:2005]

EXAMPLE Ultrasonic testing.

3.7
NDT technique
specific way of utilizing an NDT method

[ISO 9712:2005]

EXAMPLE Immersion ultrasonic testing.

3.8
capability
ability and/or skill to execute a specific NDT task

3.9
competence
product knowledge and capability to carry out a specific NDT task

3.10
Level 3 individual
person certified to Level 3, in accordance with ISO 9712 or equivalent, in the method and product for which he/she is authorized by the qualifying body to conduct, supervise and grade the qualification examination

3.11
general examination
written examination, at Level 1 or 2, concerned with the principles of an NDT method

[ISO 9712:2005]

3.12
significant interruption
absence that prevents the qualified individual from practicing the duties corresponding to the level in the relevant method for a continuous period in excess of 1 year or a number of periods for a total time exceeding two years

3.13
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

[ISO 9712:2005]

4 General principles

4.1 Under the requirements of this International Standard, the employer has sole responsibility for providing a declaration of competence that a person in its employ performing NDT tasks has a prerequisite qualification and has successfully passed qualification examinations, conducted under the auspices of the employer, in one or more of the NDT methods covered by this International Standard, in respect of one of the two levels of competence (Level 1 or Level 2).

As an alternative to the use of qualified Levels 1 and/or 2 personnel in the regular employ of the employer to carry out the required NDT operations, the employer is permitted to engage, on a contract basis, certified Level 1 or Level 2 personnel in accordance with ISO 9712 or equivalent.

In addition, a certified Level 3 individual, either in the regular employ of, or engaged by, the employer, has the responsibility for administering Level 1 and Level 2 personnel qualification examinations.

4.2 The prerequisite qualification requirements in terms of visual acuity, basic education, training and experience shall be fulfilled by each candidate for eligibility for the qualification examinations. These prerequisite requirements shall be verified by the employer and endorsed on the qualification record.

4.3 The qualification examination for Level 1 and Level 2 personnel shall consist of three parts: a written general part, a written specific examination and a practical examination.

4.4 The general, specific and practical examinations of the qualification examination shall be conducted, at the employer's discretion, either by the employer's qualifying body or by the employer’s authorized/approved external qualifying body.

4.5 The employer's qualifying body shall be constituted by individuals independent of the production departments. These individuals form an independent examining body, including at least one certified Level 3 individual not necessarily in the employ of the employer but nominated by the employer's qualifying body as an examiner for Level 1 and Level 2 personnel.

Such a certified Level 3 individual shall be responsible for administering Level 1 and Level 2 personnel qualification examinations and its proper conduct.

Employer authorized/approved external qualifying bodies shall also meet these basic requirements.

4.6 The qualification examination results shall be checked/verified by the qualifying body to ensure that the pass-mark requirements have been fulfilled and the employer's qualifying body, on the qualifying body's recommendation, shall issue a qualification record in respect of the individual, with regard to the NDT method and level of competence (Level 1 or Level 2). The issue of the qualification record provides the individual with the authorization to carry out specified NDT tasks within the employer's production facilities (i.e. authorization to operate).

This qualification record is thus only valid while the individual is in the employ of, or engaged by, the employer issuing the qualification record.

4.7 The activities for qualification up to the issue of a qualification record shall be specified in a written procedure.

5 Levels of qualification

5.1 General

NDT personnel qualified in accordance with this International Standard shall be classified in one of two levels of competence (Level 1 or Level 2) with respect to specific NDT tasks to be performed.

Both levels of competence are defined in terms of NDT task content, degree of responsibility, etc. in accordance with 5.2 and 5.3.

5.2 NDT Level 1

An individual qualified to NDT Level 1 shall have demonstrated competence to carry out NDT according to NDT instruction and under the supervision of qualified Level 2 or certified Level 3 personnel. Within the scope of the competence defined on the qualification, Level 1 personnel may be authorized by the employer to

— set up the NDT equipment,

— carry out the tests,

— record and classify the results of the tests in terms of written criteria, and

— report the results.

He/she shall not be responsible for the choice of the test method or technique to be used, or for the assessment of test results.

5.3 NDT Level 2

An individual qualified to NDT Level 2 shall have demonstrated competence to perform NDT according to established procedures in the test method in which he/she is qualified. Within the scope of the competence defined for the qualification, Level 2 personnel may be authorized by the employer to

— select the NDT technique for the test method to be used,

— define the limitations of application of the testing method/technique(s),

— interpret NDT codes, standards, specifications and procedures into practical testing instructions adapted to the actual working conditions,

— set up and verify equipment settings,

— perform and supervise the tests,

— interpret and evaluate results according to applicable codes, standards or specifications,

— prepare written NDT instructions,

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

— provide guidance for personnel at or below Level 2, and

— organize and report the results of NDT tests.

6 Requirements and procedures for qualification by employer

The qualifying body, through the authorized certified Level 3 individual, shall qualify NDT Level 1 and Level 2 candidates in accordance with Clauses 7 and 8. Once the candidate has been qualified, the employer shall issue the “qualification record”.

NOTE The Level 3 individual need not be in the permanent employ of the employer.

7 Qualification requirements

7.1 General

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

7.2 Vision requirements

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 = 0,352 8 mm or 1/72 in) 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 qualification, the tests of visual acuity and colour vision shall be carried out annually and be verified by the employer.

7.3 Training

7.3.1 The candidate shall provide evidence that a course of training in the method and level for which the qualification is sought has been satisfactorily completed, and is in accordance with the requirements of the qualifying body approved by the employer.

7.3.2 Guidance on the training course content is given in the international and national standards listed in the Bibliography.

7.3.3 The minimum duration of training undertaken by the candidate for qualification shall be as defined in Table 1 for the applicable NDT method.

Table 1 — Minimum training requirements [a]

NDT method		Level 1 (hours) [b]	Level 2 (hours) [b c]
ET		40	64
FT		40	64
LT	A – Basic knowledge	8	16
	B – Pressure method	14	32
	C – Tracer gas method	18	32
MT		16	24
PT		16	24
RT		40	80
UT		40	80
VT		16	24

[a] It is recognized that, in the testing of the different products covered by 1.1, specialized NDT skills and knowledge are required to achieve satisfactory candidate performance, and the training programme should be structured to accommodate these specialized requirements.

[b] Training hours include both practical and theory courses.

[c] Direct access to Level 2 implies the total hours of Level 1 and Level 2.

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 qualification body.

7.4.2 In the event that the experience is sought following successful examination, the results of the examination shall remain valid for up to 2 years.

7.4.3 The minimum requirements for the duration of experience to be gained shall be as specified in Table 2.

Table 2 — Minimum industrial experience requirements

NDT method	**Experience** (months) [a b c]	
	Level 1	**Level 2**
ET	3	9
FT	3	9
LT	3	9
MT	1	3
PT	1	3
RT	3	9
UT	3	9
VT	1	3

NOTE Considering the predominance of automated/semi-automated systems in the NDT of the products covered by 1.1, the total experience shall be balanced to accommodate the day-to-day set-up of such systems.

[a] Work experience in months is based on a nominal 40 h/week (176 h/month) or the legal week of work. Any individual working in excess of 40 h per week, may be credited with experience based on the total hours, but shall be required to produce documentary evidence of this experience

[b] 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 where a reduction is sought, the candidate shall be required to show that, for each of the testing methods for which he seeks qualification, he has at least half of the time required in this table.

[c] For level 2 qualification, the intent of this International Standard is that work experience consist of NDT work time as an individual qualified to 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 time required for Level 1 and Level 2.

8 Qualification examination

8.1 General

The qualification examination shall consist of a general, a specific and a practical examination and cover a given NDT method. The qualifying body shall define the maximum amount of time allowed for each examination. The time allowed to the candidates for completion of each examination shall be based upon the number and difficulty of the questions.

8.2 Examination content

8.2.1 General examination

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

As a guide, the average time allowed should be no longer than 3 min per multiple-choice question.

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 qualification body.

Table 3 — Required minimum number of questions — General examination

NDT method	Number of questions
	Level 1 and Level 2
ET	40
FT	40
LT	30
MT	30
PT	30
RT	40
UT	40
VT	30

8.2.2 Specific written examination

This examination shall include a selection of questions of a specific nature on the NDT technique(s), prepared by the qualifying body. The required minimum number of questions shall be as given in Table 4.

Table 4 — Required minimum number of questions — Specific examination

NDT method	Number of questions	
	Level 1	Level 2
ET	20	20
FT	20	20
LT	20	15
MT	20	15
PT	20	15
RT	20	20
UT	20	20
VT	20	20

8.2.3 Practical examination

This examination shall be so structured as to verify the candidate's ability to perform testing of steel products to record and to analyse the resultant information to the degree required for the NDT level being sought, according to the following:

a) for Level 1: written instructions;

b) for Level 2: written instructions, specifications, codes and standards.

For Level 2, the candidate shall demonstrate the ability to prepare written instructions for Level 1.

The qualifying body shall select at least two specimens to be used for the practical examination for each NDT method under evaluation. In any case, these specimens shall not be used for training and/or production activities.

The qualifying body shall ensure that each specimen is uniquely identified and has a master report that includes all of the equipment settings used to detect specified discontinuities contained within the specimen.

8.3 Conduct of the examinations

All examinations shall be conducted under the responsibilities of the employer.

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 1 year.

Examinations shall be approved by the qualifying body. The examination shall be invigilated and evaluated by the qualifying body.

An examiner shall be responsible for grading the examination in accordance with procedures established or approved by the qualification body.

The qualification/examination shall consist of

— a verification of eligibility,

— a general, a specific and a practical examination, and

— covering a given NDT method as it is applied in steel product manufacturing.

Under the requirements of this International Standard, the qualifying body has the authority to exempt Level 1 and Level 2 individuals holding certification in accordance with ISO 9712, or equivalent, from the qualifying examinations in accordance with 8.2.

The examinations shall be specifically carried out for different types/dimensions of the same products, ensuring that personnel know the related manufacturing processes, typology of imperfections and NDT machines and are competent to perform the required NDT tasks.

The “qualification” and the “qualification record” shall be considered as “specific” for each steel product (pipes, plates, etc.)

8.4 Grading

The general examination shall be graded separately from the specific examination so that the candidate may be examined later for qualification in another part of the steel industry without having to repeat the general examination; thus a qualified operator changing from one steel product to another keeps the benefit of the general examination valid for all areas of the steel industry.

The composite grade, N, shall be calculated in accordance with the following formulae:

— for level 1: $N = 0{,}25n_g + 0{,}25n_s + 0{,}50n_p$

— for level 2: $N = 0{,}30n_g + 0{,}30n_s + 0{,}40n_p$

where

n_g is the grade for the general examination;

n_s is the grade for the specific examination;

n_p is the grade for the practical examination (general and specific).

See Annex A for guidance on the percentile weighting of the practical examination.

To be qualified, a candidate shall obtain a grade of at least 70/100 in each part of the examination and a composite grade, N, of at least 80/100.

8.5 Re-examination

A candidate who fails to obtain the pass grade required for qualification 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, nor later than 1 year after the original examination. A qualification body may use its discretion in allowing an earlier re-examination, in the event that further training acceptable to the qualification body is undertaken.

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

9 Qualification record

9.1 General

Based on the result of the qualification examinations, the employer shall announce the qualification and issue the qualification record.

9.2 Content of the document

A qualification record shall include the following:

a) the full name of the qualified individual;

b) the date of qualification;

c) the date upon which the qualification expires;

d) the level of qualification;

e) the NDT method(s);

f) the applicable sector(s) and/or product(s) concerned;

g) a unique personal identification number;

h) the signature of the qualified individual;

i) the signature, on the qualification record, of a designated representative of the qualification body.

9.3 Validity

9.3.1 The maximum period of validity of qualification is 5 years from the date of qualification indicated on the qualification record.

9.3.2 Qualification shall no longer be valid if

— an individual changes his/her employer, or

— the individual becomes physically incapable of performing his/her duties based upon the visual examination taken annually under the responsibility of the employer.

By issuing the qualification record, the employer attests the qualification of the individual but does not give any authority to operate.

NOTE The authorization to operate is documented, issued by the employer and includes a limitation to operate.

9.4 Renewal

Upon expiry of the first period of validity, qualification may be renewed by the qualification body for a new period of similar duration, provided the qualification record holder supplies documentary evidence of:

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

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

If criterion b) above for renewal is not met, the individual shall follow the same rules as for requalification.

9.5 Requalification

Prior to completion of each second period of validity, or at least every 10 years, the qualified individual may be requalified by the qualification body for a similar period, provided the individual meets criterion 9.4 a) for renewal and meets the applicable conditions described below.

The individual shall successfully complete a practical examination that assesses ongoing competence to carry out work within the scope of the qualification record as described below.

a) Annex A provides 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 requalification examination shall be allowed within 12 months of the first attempt at the requalification examination, unless otherwise approved by the qualification body.

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

10 Files

The authorized qualifying bodies shall be responsible for maintaining the following:

a) an updated list of all qualified individuals classified according to level, test method and sector;

b) a separate file for each candidate who has not been qualified, for at least 3 years from the date of application;

c) separate file(s) for each qualified individual and each individual containing:

   — application forms,

   — an examination document, such as a questionnaire, answers, description of specimens, records, result of the test, written procedures, and grade sheets,

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

   — reasons for any withdrawal of qualification;

Files shall be kept for as long as the qualification remains valid and for at least 10 years after a lapse of qualification.

Files shall be kept under suitable conditions of safety and confidentiality.

11 Introduction of new NDT methods, sectors or products

For a new qualification scheme, or when a new NDT method or new sector is added to an existing qualification scheme, the qualification body may temporarily appoint, during a period not exceeding 3 years from the date of implementation of the new scheme or method/sector/product, duly qualified personnel as examiners for the purpose of conducting, supervising and grading the qualification examinations.

Duly qualified personnel shall have the following:

a) knowledge of the principles of NDT and specific knowledge of the industry sector;

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

c) ability to conduct examinations;

d) capability to interpret the questionnaire and results of examinations.

Within 2 years of the date of appointment, these examiners shall gain qualification by satisfying the requirements for requalification as described in 9.5. The 3 year implementation period is not to be used by the qualification body as a means to qualify candidates who do not meet all the qualification requirements of this International Standard.

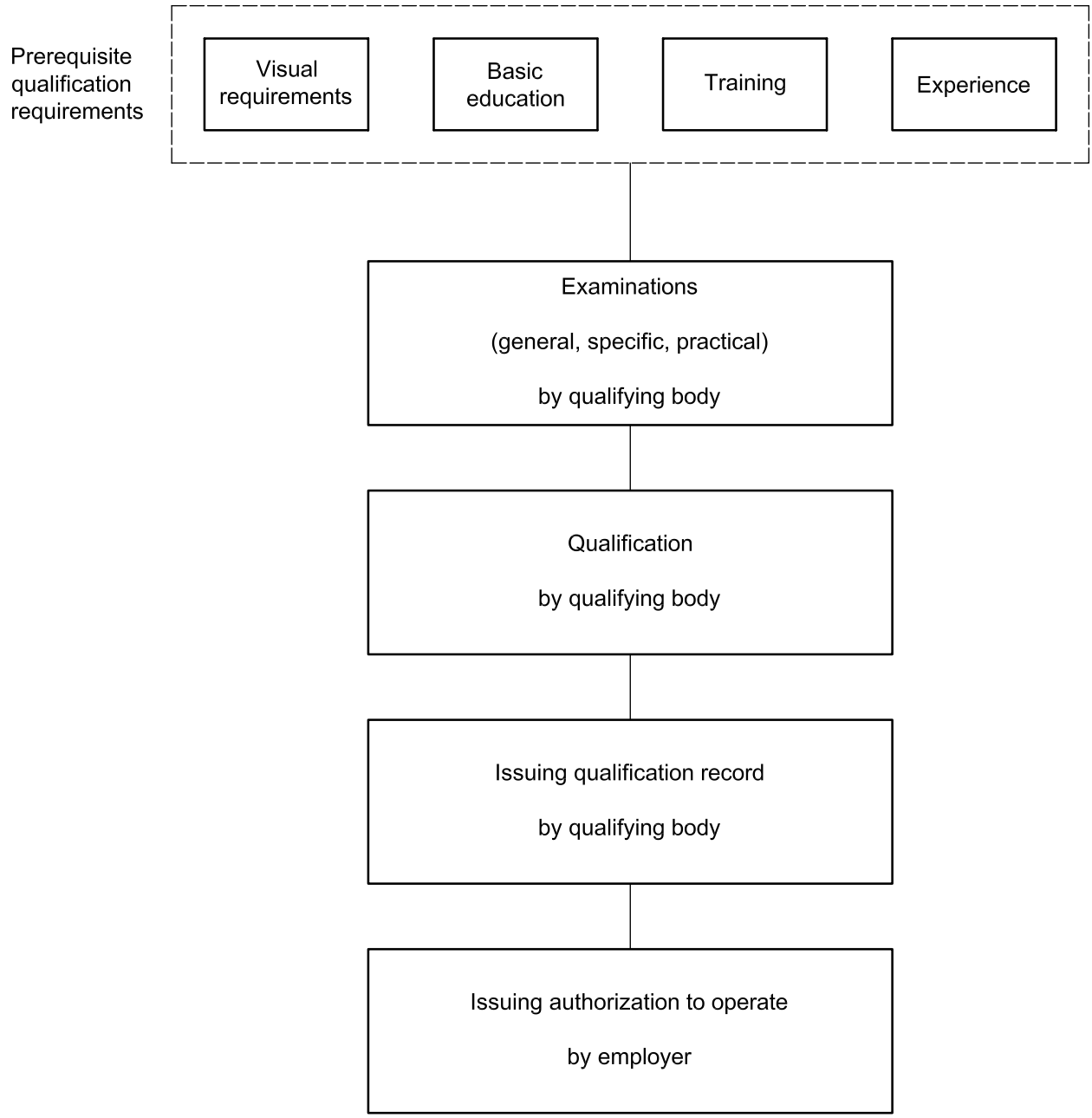

Figure 1 — Levels 1 and 2: procedure of qualification

Annex A
(informative)

Weighting of practical examination

Table A.1 — Guidance on the percentile weighting for practical examination

Part	Subject	Weighting factor %	
		Level 1	**Level 2**
Part 1: Knowledge of NDT equipment.	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 test piece (e.g. surface condition), including visual examination	5	2
	b) For Level 2, selection of the NDT technique and determination of operating conditions	n/a	7
	c) Setup of the NDT equipment	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) Equipment 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 the test	—	2
	h) Reporting the results	—	1
	Total[c]	—	**15**

[a] The 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, will be 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] To be successful, the candidate shall achieve not less than 70 % in the NDT instruction writing part, i.e. 10,5 marks out of the 15 marks allowed.

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[1] ISO/TR 25107:2006, *Non-destructive testing — Guidelines for NDT training syllabuses*

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[3] ANSI/ASNT CP-189-2006, *ASNT standard for qualification and certification of nondestructive testing personnel*

[4] ASNT RP SNT-TC-1A-2006, *Non-Destructive testing*

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