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**Steel tubes for pressure purposes —  
Qualification and certification of  
non-destructive testing (NDT) personnel**

**iTeh STANDARD PREVIEW**

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*Tubes en acier pour service sous pression — Qualification et certification  
du personnel d'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.

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.

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

[ISO 11484:1994](#)

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## Introduction

This International Standard concerns the qualification and certification of personnel engaged in non-destructive testing (NDT) of steel tubes for pressure purposes, including flat products used in the manufacture of welded tubes.

It has been recognized that within the steel tube 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 both employer and external/central qualification and certification as parallel options, 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 tubes and flat products used in the manufacture of welded tubes is clearly outside the scope of ISO 9712 (see sub-clause 3.20 of ISO 9712:1992).

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 tubes for non-pressure purposes, and other specific product areas as appropriate.

# Steel tubes for pressure purposes — Qualification and certification of non-destructive testing (NDT) personnel

## iTeh STANDARD PREVIEW (standards.iteh.ai)

### 1 Scope

**1.1** This International Standard describes the qualification and certification of personnel engaged in non-destructive testing (NDT) of seamless and welded steel tubes, including flat products used in the manufacture of welded tubes, for pressure purposes.

**1.2** It specifies the training, qualification and certification requirements for three levels of NDT personnel competence to execute specific tasks in the NDT of seamless and welded steel tubes, including the weld seam, and flat products used in the manufacture of welded tubes.

**1.3** This International Standard permits both employer and external/central qualification and certification of NDT personnel as parallel options in the qualification/certification process, subject to certain specified restrictions.

**1.4** This International Standard is intended to apply to NDT personnel performing the inspection of seamless and welded tubes, including the weld seam, and flat products used in the manufacture of welded tubes, using any of the following NDT methods:

a) eddy current (ET);

b) flux leakage (FT);

c) liquid penetrant (PT);

d) magnetic particle (MT);

e) radiographic (RT);

f) ultrasonic (UT).

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 9002:—<sup>1)</sup>, *Quality systems — Model for quality assurance in production, installation and servicing.*

ISO 9712:1992, *Non-destructive testing — Qualification and certification of personnel.*

1) To be published. (Revision of ISO 9002:1987)

ISO/IEC Guide 40:1983, *General requirements for the acceptance of certification bodies*.

EN 45013:1989, *General criteria for certification bodies operating certification of personnel*.

ASNT Standard CP 189, *Qualification and Certification of Non-Destructive Testing Personnel*.<sup>2)</sup>

ASNT Recommended Practice SNT-TC-1A.<sup>2)</sup>

### 3 Definitions

For the purposes of this International Standard, the following definitions apply.

**3.1 qualification:** Demonstration/evidence of the knowledge, skill, training, experience and physical capability required to perform specific NDT tasks properly, with a view to achieving certification.

**3.2 certification:** Procedure providing a written testimony of qualification leading to the issue of a certificate by a certifying body.

**3.3 Certifying Body:** Body operating in accordance with the requirements of ISO/IEC Guide 40 as implemented by the requirements of EN 45013 and ISO 9002 as follows:

- a) an employer's department independent of the Production Department (e.g. QA/Technical);
- b) an independent Certifying Body approved by the relevant Accreditation Body.

**3.4 Qualifying Body:** Employer's independent department, a recognized authority or an external organization authorized to undertake the preparation and administration of examinations which lead to the qualification of NDT personnel, operating under the aegis of the Certifying Body.

**3.5 employer:** Corporate entity which employs NDT personnel to execute NDT tasks for wages, salary, fees or other considerations.

**3.6 candidate:** An individual seeking qualification and subsequent certification.

**3.7 set-up:** Mechanical and/or electronic adjustment of NDT equipment to establish the testing parameters and testing sensitivity required by the product specification.

2) American Society for Non-Destructive Testing.

**3.8 NDT method:** A discipline applying a physical principle in non-destructive testing (e.g. ultrasonic method, eddy current method, etc.).

**3.9 NDT technique:** A specific manner of utilizing an NDT method (e.g. ultrasonic immersion technique, eddy current concentric coil technique, etc.).

**3.10 capable:** Having ability or skill to execute an NDT task.

**3.11 competence:** Having sufficient NDT and product knowledge.

## 4 Levels of competence

### 4.1 Classification

NDT personnel certificated in accordance with this International Standard shall be classified in one of three levels of competence (Level 1, Level 2 or Level 3) with respect to specific NDT tasks to be performed.

In addition, the further classification "trainee" is specified for NDT personnel engaged in the testing of seamless and welded steel tubes, including the weld seam, and flat products used in the manufacture of welded tubes.

All four classifications are defined in terms of NDT task content, degree of responsibility, etc. in accordance with 4.2 to 4.5.

**NOTE 1** It should be recognized that an individual handling seamless and welded tubes and/or flat products used in the manufacture of welded tubes in connection with non-destructive testing equipment, or acting as the user of automatic/semi-automatic test systems is not required to be qualified/certificated under the requirements of this International Standard, since such an individual has no involvement in the adjustment/set-up of the NDT equipment itself or the recording of test results.

### 4.2 Trainee

This is an individual in the process of receiving training and experience with the aim of obtaining NDT Level 1 qualification and certification, or for direct access to NDT Level 2.

### 4.3 NDT Level 1

An individual certificated to NDT Level 1 is qualified to carry out NDT operations according to written in-

structions and under the supervision of Level 2 or Level 3 personnel. As appropriate to the testing technique(s) being used, he/she shall be able:

- to set up the equipment;
- to carry out the tests;
- to record and classify the results in terms of written criteria;
- to report on the results in terms of written criteria.

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.

#### 4.4 NDT Level 2

An individual certificated to NDT Level 2 is qualified to perform and direct non-destructive testing according to established or recognized procedures. As appropriate to the testing technique(s) being used, he/she shall have the competence:

- to choose the technique for the test method;
- to set up the equipment;
- to perform and to supervise the tests;
- to interpret and evaluate test results according to applicable standards, codes or specifications;
- to define the limitations of application of the testing method/technique(s) for which a Level 2 individual is certificated;
- to adjust the operating parameters of NDT adapted to the problems which are the subject of specifications or procedures;
- to prepare written test instructions;
- to carry out and to supervise all Level 1 duties;
- to train or to guide personnel below Level 2;
- to organize and report on NDT results.

#### 4.5 NDT Level 3

An individual certificated to NDT Level 3 shall have competence in and be capable of:

- assuming full responsibility for a test facility and staff;

- establishing techniques and procedures;
- interpreting codes, standards, specifications and procedures;
- designating the particular test methods, techniques and procedures to be used.

He/she shall also have:

- the competence to interpret and evaluate results in terms of existing codes, standards and specifications;
- sufficient practical background in applicable materials, fabrication and product technology to select methods and establish techniques and to assist in establishing acceptance criteria where none are otherwise available;
- a general familiarity with a variety of other NDT methods;
- an ability to train Level 1 and Level 2 personnel.

When so nominated, he/she shall train Level 1 and Level 2 personnel and/or manage and supervise qualification examinations (see 5.1).

## 5 Requirements and procedures for qualification and certification

### 5.1 NDT Levels 1 and 2 personnel (see figures 1 and 2)

All Level 1 and Level 2 NDT personnel shall be qualified and certificated by one of the following parallel options.

#### 5.1.1 Qualification/certification by the employer's Qualifying Body

The employer's Qualifying Body, through the vested authority of an NDT Level 3 individual, shall qualify NDT Level 1 and Level 2 candidates in accordance with 6.2 and 7.1. Once qualified, NDT Level 1 and Level 2 personnel shall be certificated by the employer's Qualifying Body.

NOTE 2 The Level 3 individual need not be in the permanent employment of the employer.

#### 5.1.2 Qualification/certification by an independent Certifying Body

NDT Level 1 and Level 2 candidates shall be qualified by a Qualifying Body under the aegis of the appropriate Certifying Body in accordance with 6.2 and 7.1.

On completion of all the qualification requirements, a certificate shall be issued by the Certifying Body. In addition, Certifying Body certificated Level 1 and Level 2 personnel shall be further qualified by the employer's Qualifying Body in accordance with 7.1.2 and 7.1.3 to attest to the individual's competence in specific and practical aspects of the NDT tasks to be executed. Once further qualified, such NDT Level 1 and Level 2 personnel shall be certificated by the employer and thus hold dual Certifying Body/employer certification.

## 5.2 NDT Level 3 personnel (see figure 3)

All level 3 NDT personnel shall, in accordance with this International Standard, be qualified to the requirements of 6.3 and 7.2 (excluding the method-specific and practical examinations) by an independent Qualifying Body (i.e. independent of the employer of this candidate). The purpose of this requirement is to attest the academic competence of NDT Level 3 personnel.

In addition to the above, a written testimony shall be provided by the employer to the independent Certifying Body, that the qualified individual satisfies the method-specific and practical examination requirements of this International Standard. The individual will thus be deemed certificated NDT Level 3 by the independent Certifying Body, which is required to issue a Level 3 certificate.

Once certificated by the Certifying Body, NDT Level 3 personnel, via the Qualifying Body, have a vested authority to qualify NDT Level 1 and Level 2 personnel.

NDT Level 3 personnel shall be nominated by the employer in any one or more of the following categories:

- a) testing;
- b) training;
- c) Examining.

## 6 Qualification requirements

### 6.1 General

Candidates for qualification/certification in accordance with this International Standard shall have a combination of physical capability and basic education, together with the necessary training and experience in the applicable NDT method.

The requirements for eligibility of candidates seeking Level 1 and Level 2 qualification are given in 6.2 and the requirements for Level 3 are given in 6.3.

### 6.2 Levels 1 and 2

The minimum eligibility requirements for candidates seeking NDT Level 1 and Level 2 qualification are as follows.

#### 6.2.1 Visual requirements

Near vision acuity to Jaeger Chart J2 or equivalent, at not less than 30 cm in at least one eye, aided or unaided, including sufficient colour vision appropriate to the NDT method being used, shall be verified annually under the responsibility of the employer. Failure to comply with this requirement will render the eligibility invalid.

#### 6.2.2 Basic education

The minimum requirement is basic education in the form of attendance at primary and secondary schools or education centres in accordance with the national statutory regulations. No level(s) of attainment in basic education is(are) necessary, however appropriate proof of attendance is a requirement.

#### 6.2.3 Training

Each candidate shall provide evidence of successful completion of a training programme in the applicable method approved by the Qualifying Body and acceptable to the Certifying Body. The minimum training periods for Level 1 and Level 2 are given in table 1.

**Table 1 — Minimum training period**

Method	Level 1	Level 2
	(hours)	(hours)
ET	40	60
FT	40	60
PT	16	24
MT	16	24
RT	40	80
UT	40	80

The periods given in table 1 include both theoretical and practical training.

Direct access to NDT Level 2 requires a minimum training period of the sum of the hours given for Level 1 and Level 2.



It is recognized that, in the testing of tubes and flat products used in the manufacture of welded tubes, specialized NDT skills and knowledge (e.g. automated systems) are required to achieve satisfactory candidate performance and the training programme shall be so structured to accommodate these specialized requirements.

#### 6.2.4 Experience

Each candidate shall provide evidence of having the necessary experience in the applicable method with respect to the basic techniques and specialized skills required during the testing of tubes and flat products used in the manufacture of welded tubes. The minimum periods of experience for Level 1 and Level 2 are given in table 2.

**Table 2 — Required minimum periods of experience**

Method	Level 1 (months)	Level 2 (months)
ET	3	9
FT	3	9
PT	2	9
MT	1	3
RT	3	9
UT	3	9

Work experience in months is based on a nominal 40 h per week (175 h per month). When a candidate is working in excess of 40 h per week, he/she shall be credited with an experience period based on the total number of hours worked on the applicable method.

Direct access to Level 2 qualification/certification requires a minimum experience period of the sum of the months given for Level 1 and Level 2.

When a candidate has obtained concurrently experience in two or more NDT methods covered by this International Standard, a reduction in the total experience period required for each method is permitted as follows:

- two NDT methods: a reduction of 25 % of the sum of the periods required for each method;
- three NDT methods: a reduction of 33 % of the sum of the periods required for each method;

- four or more methods: a reduction of 50 % of the sum of the periods required for each method.

In applying the above rules, under no circumstances shall a candidate have less than 50 % of the minimum experience period requirement, as given in table 2, in any one method.

It is recognized that in the testing of tubes and flat products used in the manufacture of welded tubes there is a predominance of automatic/semi-automatic systems and the total experience of the candidate shall be so balanced to accommodate the day-to-day set-up of such systems.

### 6.3 Level 3

The minimum eligibility requirements for a candidate seeking NDT Level 3 qualification are as follows.

#### 6.3.1 Visual requirements

Visual requirements as specified in 6.2.1.

#### 6.3.2 Basic education

- Basic education as specified in 6.2.2, or
- successful completion of at least 2 years of engineering or science study at a nationally recognized college, university or technical school, or
- graduate of at least a 3-year course at a nationally recognized engineering or science college or university.

#### 6.3.3 Training

Each candidate seeking NDT Level 3 qualification shall supply sufficient evidence, to the satisfaction of the Qualifying Body and acceptable to the Certifying Body, that attendance at training courses on NDT-related subjects has been undertaken, along with participation in seminars, conferences, etc. on NDT and related subjects. No number of training hours is specified, due to the complex nature of acquiring knowledge which may be accomplished in many different possible ways by a Level 3 candidate.

#### 6.3.4 Experience

NDT Level 3 candidates shall provide evidence of having the necessary experience in the applicable method and in at least two other methods, one of which shall be essentially similar in objective to the primary method (i.e. surface inspection or volumetric inspection) with respect to the specialized techniques and skills required during the testing of tubes and of

flat products used in the manufacture of welded tubes. The minimum period of experience for Level 3 candidates is given in table 3.

**Table 3 — Required minimum periods of experience for access to Level 3**

Education	Direct access to Level 3 (not holding Level 2 certification) (months)	Access to Level 3 by Level 2 certificated candidate (months)
Graduate of at least a 3-year course at a nationally recognized engineering or science college or university	24	12
Successful completion of at least 2 years of engineering or science study at a nationally recognized college, university or technical school	48	24
Basic education (as per 6.2.2)	72	48

If the college or university degree is issued in non-destructive testing, the minimum period of experience required for access to Level 3 shall be reduced by 50 %.

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

- two NDT methods: 25 % reduction in total time required;
- three NDT methods: 33 % reduction in total time required;
- four or more NDT methods: 50 % reduction in total time required.

For case c), the candidate shall be required to show that, for each of the methods for which he/she seeks qualification, he/she has at least 50 % of the period of experience specified in table 3.

## 7 Qualification examinations

The qualification examination shall consist of a general and a specific examination and cover a given NDT method as it is applied in the steel tube industry including, where appropriate, flat products used in the manufacture of welded tubes.

Under the requirements of this International Standard, the Qualifying or Certifying Body has the authority to exempt individuals holding certification as in a) and b) below from the qualifying examinations according to 7.1, 7.2 and 7.4, as appropriate:

- for Levels 1 and 2: in accordance with ASNT Recommended Practice SNT-TC-1A;
- for Level 3: individuals holding a valid ASNT Level 3 certificate either in accordance with ASNT Standard CP189, or as a result of the ASNT certification programme or a nationally recognized accredited certification programme.

### 7.1 Content of the examination for Levels 1 and 2

The examination shall consist of a written part, general and specific, and a single practical part. The practical part shall be of sufficient duration, complexity and scope to verify adequately the candidate's ability to apply the NDT method and/or technique(s) to real test situations.

#### 7.1.1 General written examination

This examination shall include a selection of questions of a general nature on the NDT method, 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 (general examination)**

Method	Level 1	Level 2
ET	30	30
FT	30	30
PT	30	30
MT	30	30
RT	40	40
UT	40	40

**7.1.2 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 5.

**Table 5 — Required minimum number of questions (specific examination)**

Method	Level 1	Level 2
ET	15	15
FT	15	15
PT	20	15
MT	20	15
RT	20	20
UT	20	20

**7.1.3 Practical examination**

This examination shall be so structured as to verify the candidate's ability to perform testing of steel tubes and, where appropriate, flat products used in the manufacture of welded tubes, to record and to analyse the resultant information to the degree required for the NDT level being sought, according to:

- 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.

Where specimens are used for the practical examination, they shall be selected and verified by the Qualifying Body.

**7.2 Content of the examination for Level 3**

The examination shall consist of the following written parts.

- a) **Basic examination** proving the candidate's technical knowledge of materials science and technology related to the activity of the candidate in the qualification and certification system defined in this International Standard, and general knowledge of the principal method for which qualification is sought and at least two other relevant methods as chosen by the candidate. These two additional methods must include at least one

volumetric method (UT, RT or FT) and one surface method (MT, PT or ET).

This examination shall be passed first and is valid indefinitely.

- b) **Main-method examination** for which the qualification is sought.

This examination consists of:

- 1) a general examination covering basic knowledge relating to the test method applied (this part, once passed, is valid indefinitely);
- 2) a method-specific examination relating to the application of the NDT method to the tube industry, including the applicable codes, standards and specifications;
- 3) a practical examination concerning the drafting of one or more NDT procedures or instructions.

**7.2.1 Basic examination**

The examination questions shall be selected from the independent Qualifying Body's collection at the time of this examination. The required minimum number of questions shall be as given in table 6.

**Table 6 — Required minimum number of questions (basic examination)**

Part	Field/Area	Number
A	Qualification and certification procedure	10
	Materials science and technology	25
	Typical product imperfections	
B	General knowledge	15 for each test method (total 45)

All the questions shall be multiple-choice questions. The total duration of this examination shall be a scheduled minimum of 2 h and a maximum of 3 h.

**7.2.2 Main-method examination**

The general examination questions shall be selected from the independent Qualifying Body's collection at the time of this examination.