Iranian Institute of Welding and Nondestructive testing
National welding & NDT authority in IRAN

انجمن جوشکاری و آزمایش‌های غیر مخرب ایران
مؤسسه مرجع ملی در زمینه جوشکاری و آزمایش‌های غیر مخرب

Non-destructive Testing -Training, Qualification, and Certification of Non-Destructive Testing Engineers

آزمایش‌های غیر مخرب-آموزش، تأیید صلاحیت و گواهی کردن مهندسین آزمایش‌های غیر مخرب

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In the name of God

About Iranian Institute of Welding and Non-Destructive Testing

Iranian Institute of Welding and Non-Destructive testing(IWNT), the first and most experienced scientific association in the field of welding and non-destructive testing in IRAN started its activities in 1980 and then was registered to have No. 7438 with a statute under the supervision of the Ministry of Science, Research and Technology in 1992. Iranian Institute of Welding and Non-Destructive testing due to the given authority in the Commission of Scientific Associations of the Ministry of Science, Research and Technology, has the permission of work and it is responsible as authorized National body for Welding and Non-Destructive testing in IRAN. The goals of this institute are as follows:

- Research on welding and non-destructive testing,
- Gathering information on the latest technical developments worldwide,
- Helping solve the technical problems of industry,
- Publishing professional journals,
- Making efforts to raise technical and professional awareness,
- Publishing books and reference handbooks,
- Holding technical fairs and competitions,
- Organizing professional training courses,
- Certification issuance for individuals and organizations,
- Holding scientific conferences and seminars,
- Publishing national, IWNT, and factory standards.

This institute organized the standard committee and quality systems to promote the culture of the standard on 29 July 2006 and the first formal meeting of the standard committee of the Iranian Institute of Welding and Nondestructive Testing was held in Isfahan on 05 August 2006 and the Committee began its activities formally. The Committee signed a memorandum of understanding on editing standards with the Iranian national standards organization that was signed by the Director-General of the standard development office and the president of Iranian Institute of Welding and Nondestructive Testing on 29 September 2006 and holding many regular meetings and also the active presence of the committee on editing standards in the form of ISO committees and helping to activate the committees TC 13, TC 44, TC 17, TC167 and TC 261 has played a significant role in the broadcasting the culture of standard. Right now, the Committee aims at standardizing and meeting the industrial requirements of small and large industries in the country has developed IWNT standards in the field of welding and non-destructive testing. developing these standards has been composed of technical committees consisting of the association experts, experts from aware and relevant scientific, research, production, and economic centers and institutes and tries to keep pace with national interests considering manufacturing, technology, and trade conditions that are obtained by consciously and fair participation of right holders and beneficiaries such as manufacturers, consumers, exporters and importers, expertise and scientific centers and state and non-state organizations. The draft of the IWNT standards will be published after approval of the board of directors as an IWNT standard after receiving comments and suggestions from the specialized committee regarding the subject.

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Non-destructive testing —

Training, Qualification, and Certification of Non-Destructive Testing Engineers

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Prologue

Standard of " Non-Destructive Testing - Training, Qualification, and Certification of Non-Destructive Testing Engineers" published as an IWNT standard whose draft was edited and prepared in related committees by the Iranian Institute of Welding and Nondestructive Testing and was approved at the meeting of the Iranian Institute of Welding and Nondestructive Testing board of directors on 19/May/2021.

To keep pace with national and worldwide developments in the field of welding and non-destructive testing, the standards of the Iranian Institute of Welding and Nondestructive Testing will have revisions when necessary and any suggestions presented to modify and supplement these standards will be considered while reviewing at the relevant technical commission. So, the latest revision of the Iranian Institute of Welding and Nondestructive Testing is always supposed to be utilized.

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Foreword

The non-destructive testing certification system based on 3 levels (1,2 and 3) has been used for qualification and certification of personnel involved in non-destructive tests and this system has been inserted in national and international standards, regulations, and codes and accepted globally for many years.

Nondestructive testing is now one of the essential parts of any industry, production process, and manufacturing procedures to make the world a safer place to live. Non-destructive testing technological improvements, a variety of NDT methods, and the complexity of today's technical management affairs of NDT-related companies feature the vacancy of some new position (Non-destructive testing engineer).

NDT personnel qualification and certification programs can be improved in comparison to the welding qualification and certification programs. Considering welding personnel qualification, there are different levels for inspectors, however such a level equivalent to welding engineer for NDT personnel to be defined. Table A shows a comparison between different organizations and levels of certificates in terms of personnel qualification.

Table A- different organizations and levels of certificates in welding and nondestructive testing

Organizations and levels of Certificates	International Institute of Welding	American Welding Society	International Organization for Standardization	American Society for Nondestructive Testing
level 1	International Welding Inspector – Basic Level-IWI-B	AWS QC1 CAWI	ISO 9712 level 1	ASNT SNT TC 1A level 1
level 2	International Welding Inspector – Standard Level-IWI-S	AWS QC1 CWI	ISO 9712 level 2	ASNT SNT TC 1A level 2
level 3	International Welding Inspector - Comprehensive Level-IWI-C	AWS QC1 SCWI	ISO 9712 level 3	ASNT SNT TC 1A level 3
Engineer	International Welding Engineer- IWE	AWS B5.16 CWE	---	---

Too many people apply for NDT Level 3 certification which is not what they need. Most of them are holding a management or coordination position in their companies. Some of them are academic experts at universities and some of them are client representatives. By NDT engineer level addition to the NDT certification systems, wasted certification fees will be replaced by an efficient one. It should be noted that creating the NDT engineer certificate is not meant the omission of the NDT Level 3 certificate but it will complete the NDT certification system puzzle. An NDT Level 3 is deep in technical aspects of one special method and an NDT engineer is good in management and coordination aspects with a suitable and wide range of NDT technical knowledge.

Introduction

NDT Engineer defined by this standard may be responsible for all the activities linked to NDT, from the design of the equipment to the responsibility of preparation, implementation, and verification of NDT (in manufacturing and in-service) of the same equipment belonging to industrial or technical installations.

The responsibility of an NDT engineer may include:

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

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

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

d) Establish or validates the NDT specification and acceptance criteria, and evaluating NDT procedures;

e) Technical evaluation of NDT suppliers;

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

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

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

i) Development and Responsible for an NDT facility and equipment;

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

k) Qualification — validation of NDT techniques:

1) Establishment of input information’s including the inspection objectives,

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

3) Implementation of practical tests,

4) Preparation of technical justification including when necessary, modeling,

5) Preparation or validation of NDT procedures,

6) Preparation or validation of qualification dossiers;

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

m) Handling of NDT plan and ITP NDT aspects in QA/QC systems;

n) Auditing NDT activities.

Non-destructive Testing —Training, Qualification, and Certification of Non-Destructive Testing Engineers

1 Scope

This standard establishes principles for the training, qualification, and certification of personnel who perform industrial non-destructive testing engineering. The term ‘industrial’ implies the exclusion of applications in the field of medicine. It is designed to provide the core education in NDT technology required by those responsible for performing NDT engineering and coordination tasks at various levels. Additional training and/or experience may be required beyond the core education to meet the requirements of specific applications or job functions.

NOTE 1- Wherever gender-specific words such as "his", "her", "he", or "she" appears in this standard, the other gender is also applicable.

NOTE 2- As used in this standard, the word shall denote a requirement, the word should denote a guideline, and the word may denote a choice.

PRECAUTION While the non-destructive testing engineer has established excellent credentials, qualification to this standard alone may not legally qualify the engineer to provide technical services to the public. Contract documents and building or jurisdiction laws may require technical services to be performed under the direction and responsibility of others such as a registered professional engineer. The non-destructive testing engineer designation does not imply the status of a registered professional engineer (P.E.) under the laws of any state or other governmental entity.

Certification base on this IWNT international standard provides attestation of the general competence of the NDT engineering knowledge. 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 for the employer.

Where required by regulatory requirements and codes, the authorization to operate shall be given in writing by the employer under a quality procedure.

It shall be the responsibility of employers to determine that their employee, who, having qualified as aa NDT engineer, is capable of performing the specific duties involved in their career assignments.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes the requirements 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.

2.1 ISO/IEC 17024- Conformity assessment – General requirements for bodies operating certification of persons

2.2 ISO 9712- Non-destructive testing – Qualification and certification of personnel

2.3 ISO 21001-Educational Organizations-Management systems for educational organizations - Requirements with guidance for use

3 Terms and Definitions

For this document, the terms and definitions are given in ISO/IEC 17024, ISO 21001, and the following apply:

3.1

Candidate

The individual applicants who fulfill the requirements for training, qualification, and/or certification entrance.

3.2

Certificate

Document issued by the certification body under the provisions of this standard, indicating that the named person has demonstrated the competence(s) and knowledge defined on the certificate.

NOTE 1- A diploma is a certificate or deed issued without expiration that testifies that the recipient has completed a particular course or courses.

3.3

Certification

The procedure used by the certification body to confirm that the qualification requirements have been fulfilled, leading to the issuing of a certificate.

3.4

Certification body

The body that administers procedures for certification according to the qualification requirements and certification recommendations of this standard and which fulfills the requirements of ISO/IEC 17024.

3.5

Engineer

A person who is trained in or follows as a profession a branch of engineering and skilfully arrange for (something) to occur.

3.6

Employer

Organization for which the candidate works regularly.

3.7

Examiner

The person who is authorized by the certification body to conduct, supervise and grade the qualification examination.

3.8

Industrial experience

Experience, acceptable to the certification body, gained under qualified supervision, in the application of the NDT methods, needed to acquire the skill and knowledge to fulfill the provisions of qualification.

3.9

Multiple-choice examination question

The wording of a question giving rise to four potential replies, only one of which is correct, the remaining three being incorrect or incomplete.

3.10

NDT instruction

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

3.11

NDT method

Discipline applying a physical principle in non-destructive testing. Example: Ultrasonic testing.

3.12

NDT procedure

A written description of all essential parameters and precautions to be applied when non-destructively testing products under standard(s), code(s), or specification(s).

3.13

NDT technique

A specific way of utilizing an NDT method.

3.14

NDT training

Process of instruction in theory and practice in the NDT, which takes the form of training courses to an approved syllabus.

3.15

Practical examination

Assessment of practical skills, with which the candidate demonstrates familiarity, and the ability to perform the test. Such authorization can be dependent on the provision of job-specific training.

3.16

Qualification

Demonstration of physical attributes, knowledge, skill, training, and experience required to properly perform tasks.

3.17

Qualification body

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

3.18

Qualification examination

Examination, administered by the certification body or the authorized qualifying body, assesses the general, specific and practical knowledge, and the skill of the candidate.

3.19

Training Body

A body that administers procedures for training according to the requirements of this standard and which fulfills the requirements of ISO 21001.

3.20

Verification

Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled.

3.21

Validation

Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.

4 Responsibilities

The responsibilities of the certification body, authorized qualification body, examination center, training body, candidate, and certificate holder shall be at least as follows:

4.1 Certification Body

The certification system, which shall be controlled and administered by a certification body (with the assistance, where necessary, of authorized qualification bodies), includes all

procedures necessary to demonstrate the qualification of an individual to carry out tasks NDT engineer, leading to certification of competence.

The certification body shall fulfill the requirements of ISO/IEC 17024 and the following:

a) Shall initiate, promote, maintain and administer the certification scheme according to ISO/IEC 17024 and this standard;

b) Shall validate the training body published specifications for training courses that include the syllabus which embodies the content of this standard;

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

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

e) Shall monitor, under a documented procedure, all delegated functions;

f) Shall approve properly staffed and equipped examination centers which it shall monitor periodically;

g) Shall establish an appropriate system for the maintenance of records, which shall be retained for certification period plus three years;

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

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

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

4.2 Authorized Qualification Body

Where established, the authorized qualification body shall:

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

b) Be independent of any single predominant interest;

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

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

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

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

g) Maintain appropriate qualification and examination records according to the requirements of the certification body;

h) Shall be responsible for conducting the security of all examination materials (specimens, master reports, question banks, examination papers, etc.);

NOTE 1- if there are no authorized qualification bodies, the certification body shall fulfill the requirements of the qualification body**.**

4.3 Examination Center

The examination center shall:

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

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

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

d) Have adequate qualified staff, premises, and equipment to ensure satisfactory qualification examinations, the temporary use of external premises is allowed;

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

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

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

NOTE 1- an examination center can be situated at an employer’s premises. In this case, the certification body shall require additional controls to preserve impartiality and the examinations shall be conducted only in the presence of, and under the control of, an authorized representative of the certification body.

4.4 Training Body

The training body shall:

a) Fulfil the requirements of ISO 21001 and apply a documented quality management system approved by an authorized certification body;

b) Have adequate qualified staff, premises, and equipment to ensure satisfactory training;

c) Have the resources needed to administer training, including the practical courses;

d) Maintain appropriate records according to the requirements of this standard and certification body;

e) Shall be responsible for issuing training attendance certificate;

f) Shall publish specifications for training courses that include the syllabus which embodies the content of this standard;

4.5 Candidate

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

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

b) Provide verifiable documentary evidence that the required experience has been gained;

c) Abide by a code of ethics published by the training body.

4.6 Certificate Holders

Certificate holders shall:

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

b) Notify the certification body and the employer if the conditions for validity of certification are not fulfilled.

5 Access Condition for Training

The access condition shall be checked by the training body and shall be verified by the qualification body. All applicants shall pass the requirements.

5.1 Education

Each individual for being qualified as a non-destructive testing engineer shall possess one of the following combinations of education and relevant experience to be eligible to entrance non-destructive testing engineer training process:

a) Master of Science (M.Sc.) degree in engineering and engineering technology,

b) Baccalaureate of Science (B.Sc.) degree in engineering and engineering technology,

c) Baccalaureate of Science (B.Sc.) degree (related but other than engineering and engineering technology).

5.2 Industrial Experience

Base on the education level the following minimum of experience in industrial sectors is necessary to enter the training:

a) Individuals with a master of science (M.Sc.) degree in engineering and engineering technology shall have a minimum of one (1) years of related experience (In past 2 years);

b) Individuals with a baccalaureate of science (B.Sc.) degree in engineering and engineering technology shall have a minimum of three (3) years of related experience (In past 5 years);

c) Individuals with other related baccalaureate of science (B.Sc.) degrees shall have a minimum of five (5) years of related experience (In past 8 years).

NOTE 1- for item "c" the years of related experience shall include working under the direct supervision of a degreed engineer working within the areas listed in note 3. At least half of their required experience shall be in NDT.

NOTE 2- Documentary evidence of experience including a detailed description of the activities shall be confirmed by the certification body.

NOTE 3- Experience required shall be defined as activities in at least two or more of the following areas:

a) Manufacturing;

b) Fabrication;

c) Construction;

d) Research and development and training;

e) Inspection;

f) Design;

g) In-service operation.

5.3 Eligibility

The applicant shall fulfill the minimum requirements of education and industrial experience before entering the training system.

6 Training

The training content is consisting of two major parts (management and technical) which shall be managed and executed by the training body.

NOTE 1- online and/or offline distance learning for all training courses and online distance single course exams shall be accepted provided that the quality of the training system and security of examinations are approved by the certification body.

6.1 Training Courses, Syllabus and Time-Span

The minimum number of time span hours are specified for each course in table 1. Each hour will contain at least 50 minutes of direct teaching time. It is not obligatory to follow exactly the order of the modules and topics given in this standard, and choice in the arrangement of them is permitted.

The syllabus of each training item shall be indicated by the training body and validated by the certification body.

Table 1- Training courses names, number of questions for qualification written total exam and theoretical and practical duration (time-span)

Management Part			
	Course title	**Number of Questions for Qualification Written Total Exam**	**Theoretical and Practical Time(Hour)**
1	Business ethics	3	8
2	Organizational behavior and Human resource management	13	40
3	Engineering economy	8	24
4	Customer relationship management	8	24
5	Technical writing	5	16
6	Technology management	3	8
7	Quality management	5	16
8	Project management	5	16
9	Organization and management theory	5	16
	Total of management part	55	168
Technical Part			
	Course title	**number of questions for Qualification Written total exam**	**Theoretical and practical time(Hour)**
1	Visual testing	8	24
2	Penetrant testing	5	16
3	Magnetic particle testing	5	16
4	Radiography testing	16	48
5	Ultrasonic testing	16	48
6	Eddy current testing	5	16
7	Leak testing	5	16
8	Engineering drawings	5	16
9	Other NDT methods	5	16

	(infrared-VAT-AET)		
10	Advance NDT methods	5	16
11	Engineering materials	5	16
12	Strain measurement	1	4
13	Residual stress and distortion	1	4
14	Manufacturing processes & relevant discontinuities	3	8
15	Components fail, Damage mechanism and fracture analysis	10	32
16	Physical metallurgy	5	16
17	Mechanical metallurgy and DT	5	16
18	Safety in NDT	5	16
19	Financial assessment of NDT projects	3	8
20	Procedure, work instruction, reporting & documentation in NDT	1	4
21	NDT standards	1	4
22	Qualification of NDT companies	3	8
23	Design & NDT concepts	1	4
24	NDT and Risk base inspection	3	8
25	NDT and Fitness for service	3	8
26	NDT in repair, Over hall and in-service inspection	5	16
27	NDT in corrosion	10	32
28	NDT in civil engineering	3	8
29	Underwater NDT	1	4
30	QA in NDT	1	4
31	Calibration in NDT	1	4
32	NDT personnel qualification	3	8
33	ICT skills for NDT	13	40
34	Mathematics in NDT	5	16
35	Condition monitoring	10	32
36	NDT in additive manufacturing	3	8
37	Simulation of NDT	5	16
38	Free subject (To be specified by training body)	5	16
39	Dissertation	----	-----
	Total of the technical part	190	**592**
	Total	245	**760**

NOTE 1- Those having a certificate in NDT according to ISO 9712 or equivalent recognized by the certification body may be granted exemption from the NDT level parts of the modules, but not from the examinations. The approval of such arrangements is at the discretion of the certification body.

NOTE 2- the total duration of the training program shall not exceed 36 months.

NOTE 3- the content of this standard including table 1 may be used as a reference for an NDT MSc. Program at any university. The conversion of the required teaching hours of this standard into university educational units is the responsibility of the university.

6.2 Single Course Exams

The training shall consist of a written single course exam which shall be managed by the training body. The single-course examinations are mandatory and are the responsibility of the

training body to ensure that those attending the course have achieved the required level of knowledge.

The single course exam procedures shall be subject to validation by the certification body. The acceptance score for each single course exam is at least 60% of the total scores.

NOTE 1- In case of failure in each single course exam, another two exams may be conducted within three weeks. Failure in the third exam may result in retraining in the specific course.

NOTE 2- Documents of all single course exams shall be available for the certification body.

NOTE 3- the maximum time for answering each multiple-choice question is three minutes and for essay questions is ten minutes.

6.2.1 Design of Questions for Single Course Exam

At the discretion of the training body, it shall consist of:

a) A series of essay questions covering the whole field of the subject, or;

b) A series of multiple-choice questions covering the whole field of the subject, or;

c) A combination of a) and b) with equal marks allocated to each type.

All questions and answers shall be kept confidential by the training body. The masters of training courses shall design and arrange the questions.

NOTE 1- the number of questions shall not be less than the number of training hours and not more than two times of training hours.

NOTE 2- it is recommended to deliver sample questions from the training body to candidates to be familiar with the system at least one week before the exam day. The number of sample questions shall not be less than 3 times the number of questions in the original single course exam.

6.3 Training Attendance Verification Letter

After completion of all course and written single course exams, an attendance verification letter shall be issued by the training body. At the back of this attendance verification letter, a report of all exams shall be prepared and verified by the training body. This verification at least shall contain the following items:

a) The family name and forename of the individual;

b) The date of issue of the attendance verification letter;

c) Report of exams including the score of each exam;

d) The name of all training course masters;

e) The name and logo of the training body;

f) A unique personal identification number;

g) The signature of the training body manager;

h) A photograph of the individual.

7 Qualifications

The certification body (or qualification body) shall establish a mechanism to set, conduct and mark the examinations which may involve either the appointment of professional examiners responsible for the certification body's chief executive, or the creation of a board of examiners. In either case, the certification body is responsible to:

a) Review the qualification applicant's experience and qualification to assess eligibility to enter the qualification examination;

b) Organize the qualification examination;

c) Set the qualification examination questions (written and oral);

d) Conduct and mark the written and oral qualification examinations;

e) Moderate borderline results.

7.1 Access Condition for Qualification

All qualified applicants shall have an attendance verification letter and fulfill the requirements of this standard.

7.2 Qualification Examination Procedures

The qualification examination procedures described below are designed to simulate the different situations of an NDT engineer active in the industry.

The qualification shall consist of three examination parts which shall be managed by the certification body (or qualification body); the first will be a written total examination covering all the subjects of the training. Second, will be a professional oral interview to test the candidate's ability to understand standards, codes and quality documentation, and total knowledge of NDT and, the third will be a dissertation.

7.3 Written Total Exam

The written total exam shall be conducted not more than one year from the date of the attendance verification letter issued. The written total course exam is mandatory and the responsibility of the certification body. This part will examine the candidate's knowledge of NDT engineering in both technical and management.

7.3.1 Design of Questions for the Written Total Course Exam

At the discretion of the certification body, it shall consist of a series of multiple-choice questions covering the whole field of the subject. The number of questions shall be as given in table 1.

All questions and answers shall be kept confidential by the certification body. The masters of the training course shall not involve in question selection but their question bank may be used by the certification body.

NOTE 1- it is recommended to deliver sample questions from the certification body to candidates to be familiar with the system at least three weeks before the exam day. The number of sample questions shall not be less than three times the number of questions in the original total course exam.

NOTE 2- the maximum time for answering each multiple-choice question is three minutes.

NOTE 3- the total days of the written total course exam shall not exceed three days and these three days shall be within a week (seven days).

7.3.2 Acceptance Criteria of Written Total Exam Score

The acceptance criteria for written total exam Score is at least 65% of total scores. Failure in the total course exam shall require re-examination. Re-examinations must be re-taken within one to six months of the initial examination and, in the case of a second failure; one further attempt is permitted within two weeks to three months from the date of the second exam. Failure of this third attempt will result in the candidate being treated as an initial candidate and a re-take of some training will be required by the decision of the certification body.

7.4 Oral Interview

This oral interview shall be conducted not more than three weeks from the date of the written exam. The objective of this part is to test the candidate's understanding of and ability to interpret international quality standards and the quality aspects of NDT application standards, and quality-related documentation such as control manuals also total knowledge of NDT.

NOTE 1- a report of false answers and related questions shall be given to the candidate at least two weeks before the oral interview.

7.4.1 Board of Examination

The board of examination consists of five persons and shall be independent of the training body.

The combination of two persons with at least a Ph.D. degree and ten years of relevant experience from a university and three persons with at least an MSc degree and fifteen years of relevant experience from the industry shall be fulfilled.

NOTE 1- the selection of the board of examination members is the sole responsibility of the certification body (or qualification body).

7.4.2 Number and Subject of Question

The numbers of questions are based on the report of total exams and shall be selected as table 2. The subject of questions is recommended to be based on the subjects that are not answered correctly in the written total examination.

Table 2- Number of Oral Interview Questions

Average Score of total exams	Number of oral questions
65-75 Inc.	12
75-85 Inc.	8
85-95 Inc.	4
95-100 Inc.	2

7.4.3 Acceptance Criteria for Oral Interview Score

The acceptance criteria for oral interview Score is at least 65% of the total scores. Failure in oral course exam shall require re-examination. Re-examinations must be re-taken within one to six months of the initial oral interview and, in the case of a second failure; one further attempt is permitted within two weeks to three months from the date of the second exam. Failure of this third attempt will result in the candidate being treated as an initial candidate and a re-take of some training will be required by the decision of the certification body.

A report of oral interview of each candidate shall be prepared and issued by the board of examination. All asked questions and related scores and total scores shall be included.

NOTE 1- 25% of questions may be replaced by the decision of the board of examination.

7.5 Dissertation Assessments

Each candidate shall have a dissertation in the field of NDT which shall be under the supervision of an advisor professor accepted by the training body. The candidate shall prepare a written dissertation and demonstrates the project for a board of refereeing. In the project, work in form of a case study or specific NDT-related subject must be done alone by the candidate. In a project with a wide scope of application, the candidate shall be tested to the logical application of his knowledge.

The advisor professor and the subject may be proposed by the candidate but shall be accepted by the training body. In the case of rejection of proposed advisor professor and/or subject by training body, a written rejection letter with enough reasons shall be issued by training body.

Candidate shall deliver the proposal of subject and advisor professor to training body not later than 90 days after training start date and the training body shall assess and approve the proposal and inform the candidates in ten days.

NOTE 1- Dissertation is one of the total course titles and mandatory for all candidates.

NOTE 2- Copyright of dissertation is for candidate and supervisor professor.

The maximum duration for accomplishment of the dissertation is eight months from the date of training body approval of the proposal. The addition of another two months may be permitted on the written request of the candidate and approval of the training body.

The training body shall conduct a presentation meeting for evaluating the dissertation. This meeting is not part of the qualification and certification program but the candidates shall follow the training body decision in this regard.

7.5.1 Board of Refereeing for Dissertation

The dissertation date shall be arranged after each candidate pass both written and oral interview. Each dissertation shall be first approved by the dissertation advisory professor and then three copies are delivered to the certification body at least twenty days before the date of defense and the certification body shall send one copy for each referee at least fourteen days before the date of defense.

The board of refereeing consists of an advisory professor (with 20% of the total score) and two referees, one from the university and one from the industry representing the certification body, each has 40% of the total score. The head of the board of refereeing is the university referee.

The representative of the certification body shall attend all presentations. Attendance in defense meetings of dissertations shall be available for other students. In the case of acceptance of certification body, the defense meeting may be conducted by video conference.

NOTE 1- A report of each candidate dissertation refereeing shall be prepared and issued by the referring board.

NOTE 2 - The assessment of the dissertation is the sole responsibility of the referring board.

7.5.2 Acceptance Score for Dissertation

The acceptance score for the dissertation is at least 65% of the average total score.

(Total score: 20%advisory professor+40% university referee+40% industry referee)

NOTE 1- Dissertation meeting may be repeated only once again within three months. If the candidate did not pass the minimum requirement of dissertation score the referring board may decide in this regard.

8 Files

The certification (qualification) body shall issue a qualification verification letter for each candidate fulfills the qualification requirement and maintain, either in hard copy, microfilm, or read-only digitized of:

a) An updated list of all qualified individuals;

b) Individual file(s) for each qualified individual and for each individual whose qualification has lapsed containing:

1) Application forms;

2) examination documents, such as questionnaires, answers, description of specimens, records, results of the test, written procedures, and grade sheets;

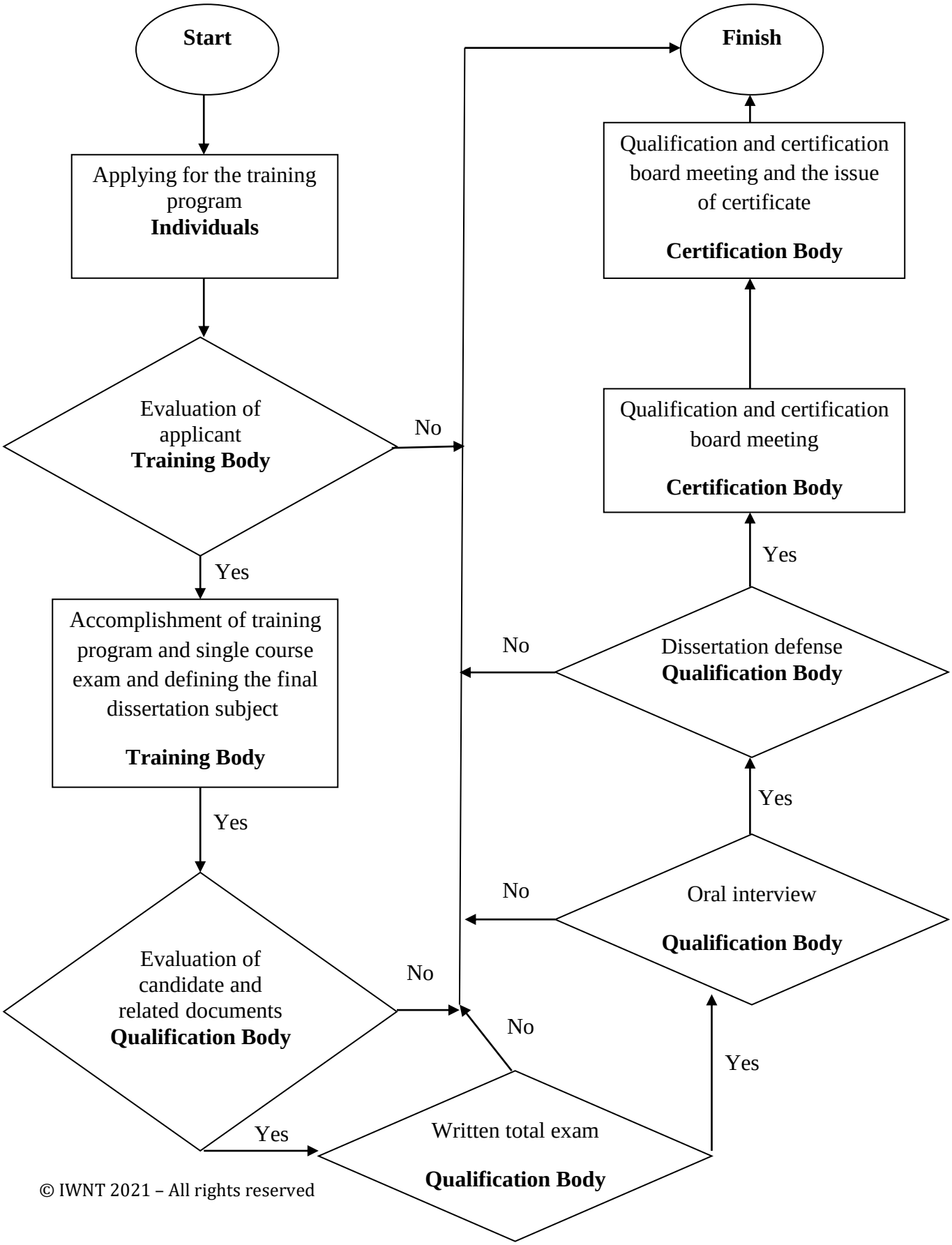
3) Dissertation file.

9 Appeal

Candidates who feel they have been unfairly treated during the examination procedure have the right to appeal to the certification (qualification) body.

NOTE 1- The certification body and the training body shall give the appeal procedure to the candidate before starting the qualification or training process.

Annex A (Informative) Program flowchart



Annex B (Informative) Guideline for the Certification Process

B.1 Access condition for certification

All qualification requirements shall be fulfilled and a valid qualification verification letter shall be available for each candidate.

B.2 Administration

A candidate fulfilling all conditions shall be certified and evidence of this certification shall be made available by the certification body.

A candidate fulfilling all conditions for certification shall be issued with a certificate and corresponding wallet card by the certification body. This can be achieved with the issue of hard copy certificate(s) and wallet card(s) and by electronically uploading and displaying the relevant information on the certification body's website.

B.3 Certificates and/or wallet cards

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

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

b) The date of issue of the certificate;

c) The name of the certification body;

d) A unique personal identification number;

e) The signature of the certified individual;

f) A photograph of the certified individual in the case of the wallet card;

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

h) The signature of a designated representative of the certification body.

B.4 Digital certificates

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

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

— The family name and forename of the certified individual;

— A unique personal identification number for the certified individual;

— A photographic image of the certified individual (taken within the past ten years);

— The dates of issue of the certificate;

— The scope of certification, including the level;

— Any limitations to the certification, if applicable.

NOTE 1- The data listed above can be printed directly from the certification body's website; the printed output shall include the date of print and a statement that the current certification status can be verified at the relevant website.

B.5 Certificate validity

The period of NDT engineer certificate validity is unlimited (Diploma) and as the certified person meets the requirements for initial certification the certificate is valid.

The certificate shall be invalid:

a) At the option of the certification body after reviewing evidence of unethical behavior;

B.6 Files

The certification body shall maintain, either in hard copy, microfilm, or read-only digitized form:

a) An updated list of all certificated individuals;

b) Individual file(s) for each certificated individual and for each individual whose certification has lapsed containing:

1) Application forms;

2) examination documents, such as questionnaires, answers, description of specimens, records, results of the test, written procedures, and grade sheets;

3) Dissertation file.

Individual files shall be kept under suitable conditions of safety and confidentiality for as long as the certificate remains valid plus three years.

B.7 Appeals procedure

Candidates who feel they have been unfairly treated during the examination procedure have the right to appeal to the certification body.

NOTE 1- The certification body shall give the appeal procedure to the candidate before starting the certification process.

Annex C (Informative) Guide for Preparation of Technical Inquiries

Introduction

The standard and quality systems committee of the Iranian Institute of Welding and Nondestructive Testing is going to consider the written requests for interpreting IWNT standards.

Technical inquiry format

Technical inquiries are supposed to be related to the standard interpretation or standard revision considerations according to the new information and technology. Written requests must include the following items:

A. Standard name and number and also its edition
The standard name and number accompanied with its edition number should be thoroughly mentioned. Moreover, the year of the standard edition has to be mentioned.

B. Purpose and application scope
The purpose and scope of the inquiry should be restricted to one topic or group of topics closely related to each other. Technical inquiries dealing with a couple of or more independent matters are going to be returned

C. The background section
The technical inquiry ought to be started with a background section that explains the aim of the inquiry. This section should shortly provide the required data to fully comprehension of the inquiry and should mention the standard name, revision number, paragraph, figures, and the intended tables

D. The main part of the inquiry
The technical question is brought up in the main section of the inquiry. The question must be short, precise, and technically spelled correctly. If the inquirer believes in the standard revision, he should offer his advice. Inquiry text must be typed or well handwritten. The inquirer must present his name and address. The membership number of the IWNT is supposed to be written on the application form.

Review and respond to technical inquiries
Received inquiries should be brought up at the standard and quality systems committee of the Iranian Institute of Welding and Non-destructive Testing. The inquiry response should be clear and in the form of yes or no as possible. The inquiry format has been presented as follows:

Form C-1	
Technical Inquiry of IWNT Standards	
Name, number, and revision of standard:	
Purpose and application scope	
The background section	
The main part	
Inquirer	
First name and family name:	IWNT membership Number:
Organization:	Contact phone:
Position:	Email:
Address:	Telefax:
signature	Date:
Date Received: **Registration number:** **Response date:**	**This section will be completed by IWNT**

Annex D (Informative) IWNT Standard's Numbering System

Prefix	Main Subject
IWNT S1.	- Training
IWNT S2.	- Examination, Qualification, and Certification
IWNT S3.	- WPS & PQR
IWNT S4.	- Nondestructive tests
IWNT S5.	- Destructive Tests
IWNT S6.	- Quality Assurance
IWNT S7.	- Quality Control
IWNT S8.	- Welding Consumables
IWNT S9.	- Guideline for welding, brazing, and soldering process
IWNT S10.	- Welding guideline of materials
IWNT S11.	- Guideline for welding of structures and equipment
IWNT S12.	- Preheating and PWHT
IWNT S13.	- Metallurgy
IWNT S14.	- Repair
IWNT S15.	- Surfacing and hard facing
IWNT S16.	- Underwater welding
IWNT S17.	- Vocabulary and definition
IWNT S18.	- Welding symbols
IWNT S19.	- Welding equipment and axillaries
IWNT S20.	- Design
IWNT S21.	- Welding and related process economy
IWNT S22.	- Cutting and gouging
IWNT S23.	- Safety and health

For more information about IWNT standard's numbering system please contact us: www.iwnt.com

Bibliography

[1] An Encyclopaedia of Non-destructive Tests-ISBN 9786003960404.

[2] CEN/TS 15053, Non-destructive testing – Recommendations for discontinuities-types in test specimens for examination.

[3] CEN/TR 14748, Non-destructive testing – Methodology for qualification of non-destructive tests.

[4] ISO 21001, Educational organizations -- Management systems for educational organizations -- Requirements with guidance for use.

[5] ISO/IEC 17024, Conformity assessment – General requirements for bodies operating certification of persons.

[6] ISO 9712, Non-destructive testing – Qualification and certification of personnel.

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