



CERTIFICATION SCHEME FOR WELDING AND INSPECTION PERSONNEL

DOCUMENT No. CSWIP-ES-NDT-12-04

Requirements for Employer Specific Certification of Personnel Engaged in Non-Destructive Testing in accordance with the requirements of EN 473 and ISO 9712

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Issued under the authority of the Governing Board for Certification
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FOREWORD

The Certification Scheme for Welding and Inspection Personnel (CSWIP) is a comprehensive scheme which provides for the examination and certification of individuals seeking to demonstrate their knowledge and/or competence in their field of operation. The scope of CSWIP includes Welding Inspectors, Welding Supervisors, Welding Instructors Cathodic Inspection personnel, Bolting Technicians, Plant Inspectors and Underwater Inspection personnel and NDT personnel.

CSWIP is managed by the Certification Management Board, which acts as the Governing Board for Certification, in keeping with the requirements of the industries served by the scheme. The Certification Management Board, in turn, appoints specialist Management Committees to oversee specific parts of the scheme. All CSWIP Boards and Committees comprise member representatives of relevant industrial and other interests.

ACCESS TO CERTIFICATION

Access to certification is not improperly restricted. The sole criteria for certification are given in the document (and any subsequent amendments) and no other criteria will be applied. Certification is not conditional on the candidate applying for other services or membership from TWI Certification Ltd, its parent and any other groups or associations.

1 GENERAL

This document prescribes procedures by which personnel may be examined and, if successful, certificated for ultrasonic testing, magnetic testing, liquid penetrant testing, visual and optical testing, radiographic testing, radiographic interpretation or * other NDT methods as applied to an employers specific products.

The requirements for examination eligibility, examination format and the rules governing certificate validity and renewal are, as a minimum in compliance with ISO 9712(1) and EN 473(2).

* The term “Other NDT methods” is in this document defined as one of a range of techniques such as thermography, shearography, or leak detection which are not as yet covered by national standards.

HSE has published best practice guides for the procurement and conduct of NDT, currently covering ultrasonic testing, magnetic particle testing and penetrant testing (3,4). These documents include guidance on the level of inspection linked to component failure and on operator performance, for example:

- Operators should be given appropriate training and qualification
- Operators should be given practice on realistic test pieces
- Job specific qualifications should be considered
- Inspections should be subject to supervision and audit
- Good access should be provided
- A reasonable time should be allocated, including regular breaks
- The inspection environment should be as benign as possible with respect to temperature, shelter, requirements for protective clothing, etc

- Independent repetition of tests should be considered.

It is recommended that those involved in the procurement and conduct of NDT take account of the guidance provided by these documents.

2. SCOPE

Employer specific examinations are considered to be appropriate when an employer requires certification covering his particular products. Certification issued in accordance with this document will bear the name and address of the employer and outline the specific product form covered. Employers are required to produce and maintain a company written practice for the control and administration of NDT personnel training, examination and certification.

Certification comprises two parts:

- i) General (theory and practical common to all applications of a particular method of NDT)
- ii) Sector specific (theory and practical for the method related to a specific application)

The training and examination syllabi and the question banks utilised will be developed jointly by the employer and CSWIP.

General and sector specific examinations are conducted by, or under the control of, an Examining Body authorised by TWI Certification Ltd. The present requirements are intended to meet the majority of users' needs for the practical non-destructive testing to provide industry with an assured minimum standard of proficiency.

The examination is designed to test the candidate's grasp of the subject and his/her understanding of the operations he performs. The examination procedure involves written and practical examinations.

The practical section of the examination will involve the candidate testing products typical of those produced by their employer. Practical examination specimens will be segregated and held in secure storage approved by CSWIP with master records retained by CSWIP. Such specimens will not be used for training purposes.

Level 1, 2 and 3 personnel are covered by these requirements.

2.1 NDT Level 1 Personnel

An individual certified to Level 1 is qualified to carry out NDT operations in accordance with written instructions and under the supervision of Level 2 or 3 personnel. The individual shall be able to set up the equipment, carry out the tests, record the results obtained, classify the results in accordance with written criteria and report the results. He/She shall not be responsible for the choice of the test method or technique to be used, nor for the assessment of test results.

2.2 NDT Level 2 Personnel

An individual certified to NDT Level 2 is qualified to perform and direct non-destructive testing in accordance with established or recognised techniques. The individual shall be competent to choose the test techniques to be used; to set up and calibrate equipment; to interpret and evaluate results in accordance with applicable codes, standards and specifications; to carry out all duties for which a Level 1 individual is qualified and to check that they are properly executed; and to prepare written instructions and organise and report the results of non-destructive tests. The individual shall also be familiar with the scope and limitations of the method for which he/she is qualified, and be able to exercise assigned responsibility for on-the-job training and guidance of trainees and NDT Level 1 personnel.

2.3 NDT Level 3 Personnel

An individual certified to NDT Level 3 shall be capable of assuming full responsibility for a test facility and staff; establishing techniques and procedures; interpreting codes, standards, specifications and procedures; to develop NDT procedures adapted to problems which are the subject of an NDT specification and designating the particular test methods, techniques and procedures to be used. The individual shall have the competence to interpret and evaluate results in accordance with existing codes, standards and specifications and have 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. The individual shall also have general familiarity with other NDT methods and have the ability to train level 1 and level 2 personnel.

3. ELIGIBILITY FOR EXAMINATION

Candidates shall have a combination of education, training and experience adequate to ensure that they have the potential to understand the principles and procedures of the applicable NDT method.

3.1 Training

3.1.1 Levels 1 and 2

To be eligible for certification in any NDT method, the candidate shall provide evidence of successful completion of a training programme approved by TWI Certification Ltd in that method. As a guide the minimum, training hours required are:

NDT Method	Training Hours	
	Level 1	Level 2
Liquid penetrant testing (PT)	16	24
Magnetic testing (MT)	16	24
Radiographic interpretation (RI)	-	60
Radiographic testing (RT)	40	80
Ultrasonic testing (UT)	40	80
Visual and Optical testing (VT)	16	24
Electromagnetic Testing (ET)	40	80
Other NDT methods	See note 3 below	

Notes:

1. On the job training can account for one-third of the total training hours.
2. Direct access to Level 2 implies the total hours for Level 1 and Level 2.
3. Required training hours for other NDT methods will be determined jointly by the employer and CSWIP

Candidates must provide evidence of training. A certificate of successful attendance and a copy of the training syllabus, both authenticated by a senior responsible person in the candidate's employing organisation or by a major client, will normally suffice.

3.1.2 Level 3

Taking into account the scientific and technical potential of candidates for level 3 certification, it is considered that preparation for qualification can be done in different ways: by taking training courses, attending conferences and seminars and studying books, periodicals and other specialised printed matter. No training hours are therefore specified.

3.2 Experience

3.2.1 Levels 1 and 2

To be eligible for examination, the candidate shall have the minimum experience indicated below in the method in which he/she is seeking certification:

NDT Method	Months of Experience	
	Level 1	Level 2
Liquid penetrant testing	1	3
Magnetic testing	1	3
Radiographic interpretation		4
Radiographic testing	3	9
Ultrasonic testing	3	9
Visual and optical testing	1	3
Electromagnetic Testing	3	9
Other NDT method	See note 3 below	

Industrial NDT experience may be acquired prior to or following success in the examination. In the event that the experience is sought following successful examination, the results of the examination shall remain valid for up to one year.

Notes:

- 1 Work experience in months is based on a nominal 40h/week (175 h/month). When an individual is working more than 40h/week, he/she may be credited with experience based on the total hours, but he/she shall be required to produce evidence of this experience.
- 2 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 hours required for Level 1 and Level 2. Credit for work experience may be gained simultaneously in two or more of the NDT methods with the reduction in total required experience as follows:
 - a) two testing methods – reduction of total required time by 25%
 - b) three testing methods – reduction of total required time by 33%
 - c) four testing methods – reduction of total required time by 50%

The candidate shall be required to show that, for each of the testing methods for which he/she seeks certification, he/she has at least half of the time required.

Candidates must provide evidence of experience by providing relevant information authenticated by a senior responsible person in the candidate's employing organisation or by a major client.

- 3 The required experience level will be determined jointly between the employer and CSWIP.

3.2.2 Level 3

Level 3 responsibilities require knowledge beyond the technical scope of any specific NDT method. This broad knowledge may be acquired through a variety of combinations of education, training and experience. The table below details minimum experience related to formal education.

	Degree	Experience (months)
Access to level 3 by a certified level 2 operator	Graduate of a four year accredited science or engineering college or university programme	12
	Successful completion of at least two years of engineering or science study at an accredited college, university or technical school	24
	No degree	48
Direct access to level 3 by a non-certified operator with experience equivalent to level 2	Graduate of a four year accredited science or engineering college or university programme	24
	Successful completion of at least two years of engineering or science study at an accredited college, university or technical school	48
	No degree	72
Note – If the college or university degree is issued in non-destructive testing the experience required for access to level 3 may be reduced by 50%.		

3.3 Vision Requirements

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

- a) Unaided or corrected near visual acuity in at least one eye shall be such that the candidate is capable of reading N4 Times Roman type at a distance of not less than 30cm on a standard reading test chart.
- b) colour vision shall be sufficient that the candidate can distinguish and differentiate contrast between the colours used in the NDT methods concerned.

The evidence must be in the form of a certificate issued by a medically recognised person within the previous 12 months, covering all the above points.

With all the above eligibility requirements the onus is on the candidate to provide the necessary evidence prior to examination. An examination appointment will not be confirmed until the evidence has been received. Subsequent to certification, tests of visual acuity shall be carried out annually.

4. APPLICATION FOR EXAMINATION AND FEES

When the eligibility for examination has been achieved, the next step is to take the examination.

Candidates will be required to submit an application form and a CV. All the information requested must be on these forms. No applications can be considered confirmed until receipt of correctly completed documents. Application forms ask for specific details of experience and training and must be signed to the effect that these details are correct.

In the event of a false statement being discovered on forms or on CVs any examination undertaken will be declared null and void. A certificate is automatically invalidated if there are any outstanding examination fees in respect of that certificate.

Examinations may be taken at any one of a number of Test Centres in the UK and overseas. Lists are available on request

5. CERTIFICATION AVAILABLE

Examination can be of four types: initial examinations (new candidates), supplementary examinations (certificate holders wishing to improve their existing certificates), retests (repeat of failed parts of examinations) and ten year renewal examinations.

6. EXAMINATION CONTENT

The qualification examinations include a general and a specific examination for each level of competence. Each examination consists of a written part and a practical part.

The general and specific examinations are mainly comprised of multiple-choice answer questions. The time allowed for examinations comprised of multiple-choice questions is 1.5 minutes per question. The time allowed for narrative answer questions varies but is specified on the examination paper presented to the candidate.

The practical part is of sufficient duration, complexity and scope to verify adequately the candidate's ability to apply the NDT method to real test situations.

6.1 Level 1 and 2 General Examination

In the general examination the candidate shall demonstrate proficiency in performing the relevant NDT method. The candidate is required to give answers to the fixed number multiple-choice questions shown below.

NDT Method	Number of Questions	
	Level 1	Level 2
Liquid penetrant testing	30	30
Magnetic particle testing	30	30
Radiographic testing	40	40
Radiographic Interpretation	NA	40
Ultrasonic testing	40	40
Visual and optical testing	30	30
Electromagnetic testing	40	40
Other NDT Methods	40	40

The practical test in the general examination is to verify the candidates ability make required settings and operate the test equipment properly in order to obtain satisfactory results and correctly interpret these results. The candidate is required therefore to demonstrate this ability, with comments, using the means available for each test method. For the radiographic test method, there shall be an additional examination on radiation safety (see Appendix 1 part 5).

6.2 Level 1 and 2 Specific Examination

In the specific examination the candidate shall demonstrate his ability to use the relevant test method on the specific components covered.

During the specific examination the candidate is required to give answers to a fixed number of questions, the minimum number being defined in the table below, including multiple-choice questions, calculations, written procedures and questions on codes, standards and specifications.

NDT Method	Number of Questions	
	Level 1	Level 2
Liquid penetrant testing	20	20
Magnetic particle testing	20	20
Radiographic testing	20	20
Radiographic interpretation	NA	20
Ultrasonic testing	20	20
Visual and optical testing	20	20
Electromagnetic testing	20	20
Other NDT Methods	20	20

Note: If deemed necessary the number of questions in the specific examination may be increased to 30.

The practical test in the specific examination is to verify the candidates ability to perform testing of prescribed components relating to the industrial sector concerned, to record and analyse the resultant information to the degree required, according to specific testing instructions or specifications and to the NDT level being sought.

Level 2 candidates are required to demonstrate the ability to prepare written instructions for level 1 personnel.

6.3 Level 3

The qualification examination for level 3 consists only of a written examination covering a specified test method.

The examination covers

- a. Basic knowledge relating to the test method applied for and to materials, processes and discontinuities; questions of a level 2 standard relating to other NDT methods (MT, PT, RT, UT, ET (Eddy current inspection), VT, AE (Acoustic Emission), TIR (Thermal Infra-Red inspection); requirements for the certification of NDT personnel as outlined in ISO 9712, EN 473 and SNT-TC-1A (5).
- b. Specific knowledge relating to the application of the NDT method in which the candidate is being examined including applicable codes,

standards and specifications, plus knowledge of the product being tested.

If the candidate is not qualified to Level 2 at the time of application, then he/she shall also successfully complete the practical examination in the relevant NDT method.

6.3.1 Basic Examination

The basic examination includes only multiple choice questions and consists of three sections. The number of questions and the areas covered are as shown below.

Candidates successful in Section A of the General examination will not be required to re-sit this section when attempting additional Level 3 examinations in other methods.

- A1 30 questions on materials, processes and discontinuities
- A2 10 questions on the certification body's certification and qualification system
- B Up to 60 questions of a Level 2 standard relating to the general knowledge of up to four NDT methods chosen from those listed in 3.1.1. One of those methods chosen shall be a volumetric test method (UT or RT)

6.3.2 Section B –Main Method Examination

- C1 30 questions of Level 3 knowledge relating to the test method concerned.
- C2 20 questions relating to the application of the method in the sector concerned. This maybe an open book examination where questions relating to codes, standards and specifications are concerned
- C3 The drafting of an NDT procedure for a component selected by the examiner. The use of applicable codes, standards and specifications by the candidate shall be allowed.

The two sections are graded separately.

7. GRADING

7.1 Level 1 and 2

To be certified the candidate shall obtain a grade of at least 70% in each of the four sections of the examination and a composite grade of at least 80%.

The composite grade is obtained by firstly multiplying each of the test marks by the weighting factors shown and then adding together the marks obtained.

$$\text{Composite} = 0.25N_g + 0.25N_s + 0.5N_p$$

Where N_g is the grade for the general theory examination, N_s is the grade for the specific theory examination and N_p is the grade for the general and specific practical examination.

7.2 Level 3

Section A of the general examination shall be graded separately so that the candidate may be examined later for certification in another NDT method.

To be certified the candidate shall obtain a grade of at least 70% in each section of the examination and a composite grade of at least 80%.

The composite grade is obtained by firstly multiplying each of the test marks by the weighting factors shown and then adding together the marks obtained.

Basic Examination

		Weighting Factor
Basic		0.5
Section A (grade for A1+A2/2)	x	
Basic		0.5
Section B (grade for B)	x	

Main Method Examination

The composite grade shall be calculated from the formula;

$$\text{Composite Main Method} = \frac{N_{c1} + N_{c2} + N_{c3}}{3}$$

Where N_{c1} is the grade for part C1, N_{c2} is the grade for part C2 and N_{c3} is the part for C3 of the main method exam.

To be certified the candidate shall obtain a grade of at least 70% in each section of the examination and a composite grade of at least 80%.

8. CERTIFICATION

8.1 Results Notices

All candidates will be sent a results notice. This notice will also be sent to the organisation paying the examination fee, if not paid by the candidate.

- a) The examination is evaluated by multiplying the mark achieved by the weighting factor for each component and then adding the components together to get an overall mark.
- b) Results notices will indicate whether the candidate has achieved success or otherwise in the examination, the marks gained in each part of the examination, whether retests are allowable and brief reasons for failure of any part of the examination. The personal details recorded shall be those provided by the candidate.

8.2 Successful Candidates

Two copies of a certificate of proficiency will be issued to the sponsoring organisation. Duplicate certificates to replace those lost or destroyed will be issued only after extensive enquiries.

8.3 Unsuccessful Candidates

Candidates who fail to obtain a certificate may attempt one retest on those parts of the examination in which success was not achieved. The retest must be completed within one year of the initial test; otherwise candidates will have to repeat the complete examination.

The retest (or complete re-examination) may not be taking within 30 days of the previous examination.

8.4 Period of Validity

The certificate is valid for five years from the date of completion of the initial test and may be renewed for a further five years on application, provided evidence is produced in accordance with Clause 8.5.1. Certificates are only valid provided:

- a) they are within date.
- b) they are on standard cream CSWIP paper bearing the CSWIP logo in black on gold signed by an officer of CSWIP and embossed with the CSWIP stamp.
- c) they have been signed by the individual to whom the certificate is awarded.
- d) they are accompanied by a valid official CSWIP identity card.
- e) the holder is still employed by the sponsoring organisation.

Photocopies are unauthorised by CSWIP and should only be used for internal administrative purposes.

8.5 Five year Renewal Procedure

Individuals whose certificates expire at the end of the five year period may renew their certificates for a further five years if they are able to supply evidence of reasonably continuous work activity in the relevant method during the period of validity of the certificate.

The certificate will not be renewed without further test if an authenticated complaint is received by the Governing Board during the period of validity. Further instruction and retest may then be required.

Renewal must take place not later than 21 days after the date of expiry. It is the certificate holders' responsibility to ensure that renewal takes place at the appropriate time. Only under extreme circumstances will certificates be renewed up to a maximum of six calendar months from the date of expiry shown on the certificate and late renewal will be subject to a special fee.

At the end of a further five years (i.e. 10 years from Initial certification), a renewal examination will be required consisting of the practical part of the initial examination.

A candidate unsuccessful in any section of the examination will be allowed one further attempt in the section or sections failed. If the candidate is unsuccessful in this second examination no certificate will be awarded and, to obtain a certificate, the procedure for a new candidate will have to be followed.

One retest, within four months of the 10 year renewal examination, will be allowed.

8.5.1 General Requirements

In all cases, the individual applying for renewal must meet the following criteria:

- a) provide evidence at least every second year of satisfactory vision examination (see Clause 3.3)
- b) provide evidence of continued satisfactory work activity without significant interruption

A significant interruption means an absence or a change of activity which prevents the certified individual from practising the duties corresponding to his/her level in the method and the industrial sector(s) for which he/she is certified, for one or several periods for a total time exceeding one year.

It is recommended that renewal examinations (see below) are carried out between six and one month prior to the five year expiry of the original certificate as failure to do so may affect the continuity of their

certification. Candidates failing to take the renewal examination before the expiry date of their certificate will be treated as initial candidates.

It is not possible to combine five year renewal examinations with supplementary examinations for additional groups not included in the original certificate.

Any previous certificate is invalidated upon issue of the result of the five year renewal examination.

The pass mark for all renewal examinations is 80%.

8.5.2 Levels 1 and 2 Ten Year Renewal

Inspectors whose certificates expire at the end of the ten year period will be required to undertake a renewal examination comprising practical tests only. There will be no written examination. The practical tests will be as for the initial examination.

8.5.3 Level 3 Ten Year Renewal

Inspectors whose certificates expire at the end of the ten year period will be required to undertake a renewal examination comprising:

20 multiple choice questions on standards and documentation relating to the certification of NDT operators (this section will be open book).

30 multiple-choice questions covering the application of the NDT method

8.6 Complaints and Appeals

An aggrieved party in a dispute which considers itself to have reasonable grounds for questioning the competency of a CSWIP qualified person may petition the Governing Board for non-renewal of the certificate. Such a petition must be accompanied by all relevant facts, and if in the opinion of the Board an adequate case has been presented, a full investigation of the circumstances under dispute will be initiated. If the petition is substantiated to the satisfaction of the Board, the certificate will not be renewed without further test.

Appeals against failure to certify or against non-renewal of the certificate may be made by the inspector or the employer upon application in writing to the Governing Board.

8.7 Supplementary Examinations

Certificated candidates who apply to be examined in additional groups of samples or sectors will be required to pass an additional specific theory examination in addition to the practical examination covering the extra group(s) of categories or sector.

Supplementary examinations may not be attempted 30 days prior to the expiry of an existing certificate.

Any new certificate issued as a result of such examination will incorporate the previous certificate and will be valid for five years from the date of completion of the first attempt at the supplementary examination.

9. RECORDS

The CSWIP Chief Executive maintains records of successful and unsuccessful candidates. These records are accessible to the Governing Board or its nominees at all reasonable times.

10. REFERENCES

- 1 ISO9712, 1999 (2nd Edition) 'Non-destructive testing – Qualification and certification of personnel.'
- 2 EN473, 2000 Qualification and Certification of NDT Personnel – General Principles
- 3 <http://www.hse.gov.uk/dst/ndt1.pdf> 'Best practice for the procurement and conduct of non-destructive testing, Part 1: Manual Ultrasonic Inspection
- 4 <http://www.hse.gov.uk/dst/ndt2.pdf> Best practice for the procurement and conduct of non-destructive testing, Part 2; Magnetic Particle and Dye Penetrant Inspection
5. Recommended Practice Guideline to Personnel Qualification and SNT-TC-1A, 1996 Certification in NDT

11. ADDRESSES

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For specific information on examinations and tests and arranging for them to be carried out, contact the approved Examining Body:

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