CERTIFICATION SCHEME FOR PERSONNEL

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Requirements for the Certification of Cathodic Protection Personnel

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CSWIP is administered by TWI Certification Ltd
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FOREWORD

The Certification Scheme for 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, among others, Welding Inspectors, Welding Supervisors, Welding Instructors, Welding Examiners, Welding Quality Control Co-ordinators, Heat Treatment Operatives, Cathodic Inspection Personnel, Plant Inspectors, Underwater Inspectors, Plastics Welders, Plastics Welding Inspection 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 industries and other interests. TWI Certification Ltd and this scheme are accredited by UKAS to the current version of ISO/IEC 17024.

TWI Certification Ltd understands the importance of impartiality in carrying out its certification activities, managing conflict of interest and ensuring the objectivity of all its certification activities, in accordance with ISO/IEC 17024 (latest revision).

ACCESS TO CERTIFICATION

Access to certification schemes is not improperly restricted. The sole criteria for certification are given in this 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, or any other groups or associations.

1 GENERAL

1.1 Cathodic Protection

Corrosion of a metallic material in an electrolyte is an electrochemical phenomenon in which dissolution of the material is associated with the flow of an electrical current between anodic (corroding) and cathodic (non-corroding or protected) areas. If the whole surface of the metal can be made sufficiently cathodic by means of an external electrode then corrosion will not occur. This is the basis of cathodic protection (CP), probably the most important of all methods used to protect pipelines buried in the earth, as well as marine structures and ships. Two different approaches may be used:

a) impressed current protection
b) sacrificial anode protection.

With the impressed current system, corrosion protection results from an external current applied to the buried (or submerged) structure, usually from a transformer-rectifier unit (TRU) supplying low voltage direct current (DC). The positive terminal of the TRU is connected to an inert auxiliary anode (e.g. high silicon cast iron) buried some distance from the structure to be protected, and the negative terminal to the structure itself. In practice, the current needed to protect an uncoated structure would normally be too great to make the method an economic proposition. Therefore, generally, the structure is coated or wrapped to provide the main corrosion protection barrier, and cathodic protection is used to cope with any breaks or discontinuities in the coating.

In the case of sacrificial anode protection, which is by far the older of the two systems, there is no supply of external current and the auxiliary electrode is made of a more active metal than the metal to be protected (e.g. zinc, aluminium, magnesium). Thus, it becomes the anode in the corrosion cell whilst the structure becomes a cathode that is protected sacrificially by the corroding anode.

The choice of impressed current and/or sacrificial anode systems depends on various factors. Irrespective of the type of CP system applied, however, the long-term effectiveness of the system requires adequate monitoring and surveying of performance.

1.2 Scope

The certification scheme provides qualifications for personnel at three levels: Level 1 (Cathodic Protection Data Collector), Level 2 (Cathodic Protection Inspector), and Level 3 (Cathodic Protection Senior Inspector), in accordance with the syllabus highlighted in ISO 15257 (latest edition) for the following sectors:

- On-land metallic structures
- Marine metallic structures
- Inner surfaces of metallic structures containing an electrolyte

Note 1: the syllabus for each level covers all three sectors listed above
Note 2: the syllabus does not cover reinforced concrete structures

The responsibilities for these roles are listed below.

1.2.1 Level 1 - Cathodic Protection Data Collector

Cathodic Protection Data Collector certification is for personnel with limited experience who require a basic knowledge of cathodic protection.

A Cathodic Protection Data Collector candidate is required:

- to be capable of making basic field measurements of potential for both onshore and offshore CP systems under the control of a Cathodic Protection Inspector or Cathodic Protection Senior Inspector
- to be capable of making basic protective current measurements for onshore CP systems under the supervision of a Cathodic Protection Inspector or Cathodic Protection Senior Inspector

(Note: a Cathodic Protection Data Collector is not allowed to interpret CP field test results)

- to recognise the differences between sacrificial anode systems
- to appreciate the use of insulating flanges and joints (monoblocks)
- to have a knowledge of the anodic and cathodic reactions involved in a CP system
- to appreciate the influence of coating properties and conditions on CP levels
- to have a knowledge of the function of a transformer rectifier unit (TRU).

1.2.2 Level 2 - Cathodic Protection Inspector

Cathodic Protection Inspector certification is for personnel who have a basic knowledge of cathodic protection but are required to apply more extensive theoretical and practical knowledge.

In addition to meeting the requirements for Cathodic Protection Data Collector personnel, a Cathodic Protection Inspector candidate is required:

- to be capable of making field measurements for onshore, offshore and marine CP systems, including soil resistivities and conductivities, potential and protective current measurements and interference tests
- to be capable of interpreting field test results
- to make stray current tests, but only under the control of Cathodic Protection Senior Inspector personnel

- to be capable of preparing routine field reports including recommendations for action where appropriate
- to have a knowledge of the influence of cathodic dimensions (e.g. pipeline diameter, wall thickness etc.) on protective current requirements
- to have a knowledge of the differences between impressed current anode systems, and their application
- to have a knowledge of the reasons for choice between competing sacrificial and/or impressed current systems
- to be capable of making routine design calculations and/or recommendations where modifications to an existing CP system are required.

1.2.3 Level 3 - Cathodic Protection Senior Inspector

Cathodic Protection Senior Inspector certification is for more experienced cathodic protection personnel who are required to recognise system operating problems and to solve the more difficult and complex aspects of CP, such as interference and stray current effects.

In addition to meeting the requirements for Cathodic Protection Data Collector and Cathodic Protection Inspector personnel, a Cathodic Protection Senior Inspector candidate is required:

- to be fully capable of undertaking detailed field measurements of soil resistivities, protective current demand and structure-electrolyte potentials including "Sample and Hold" readings of polarisation potentials
- to implement logical analysis of practical CP operating problems (troubleshooting) including AC and DC stray current tests, loss of current effects, coating failures, etc.
- to be capable of preparing detailed design reports with recommendations for action.

1.3 Requirements prior to taking a certification test

The job responsibilities and experience criteria for examination eligibility given below shall be followed.

1.3.1 Cathodic Protection Data Collector

Candidates should have a practical background in electricity, corrosion technology or engineering, with a minimum of one year of relevant experience, and must have successfully completed an approved course of training in cathodic protection at the appropriate level.

1.3.2 Cathodic Protection Inspector

Candidates should be qualified to Cathodic Protection Data Collector and subsequently have a minimum of one year of experience in cathodic protection

or

Candidates should have a practical background in electricity, corrosion technology or engineering, with a minimum of two years of experience in cathodic protection.

Candidates from either route must have successfully completed an approved course of training in cathodic protection at the appropriate level.

1.3.3 Cathodic Protection Senior Inspector

Candidates should be qualified to Cathodic Protection Inspector and subsequently have a minimum of two years of experience in cathodic protection

or

Candidates should have a practical background in electricity, corrosion technology or engineering, with a minimum of three years of experience in cathodic protection.

Candidates from either route must have successfully completed an approved course of training in cathodic protection at the appropriate level.

A mature candidate route offering exemption from formal training is available for Cathodic Protection Inspector and Cathodic Protection Senior Inspector candidates who are able to demonstrate at least three and five years, respectively, of recent continuous experience in cathodic protection.

2 EXAMINATION PROCEDURE

2.1 Cathodic Protection Data Collector

Cathodic Protection Data Collector candidates are required to take a theoretical examination.

The theory examination paper consists of 30 multiple-choice questions, which are made up of simple calculations based on equations used in cathodic protection (e.g. Ohm's Law) or explanatory sketches of CP situations. The time allowed shall be 120 minutes.

Note: No separate practical examination is conducted. Practical topics (including metal activity, potential measurement, series and parallel circuits, DC current measurements, resistivity using soil box, etc.) are included in the theory paper.

Details of the examination syllabus are given in Appendix 1.

2.2 Cathodic Protection Inspector

Cathodic Protection Inspector candidates are required to take theoretical and practical examinations.

The theoretical examination consists of 35 multiple-choice questions, which are made up of simple CP design calculations (e.g. anode resistance, anode current, etc.) or explanatory sketches of CP situations. The time allowed shall be 120 minutes.

For the practical examination, candidates will be required to demonstrate their competence in measuring techniques such as structure-electrolyte potentials, galvanic and impressed current systems, current measurements, and determination of On and Off potentials.

Practical examination include a minimum of five measurements on the following systems: soil box, series and parallel resistance, metal activity and potential measurements, use of coupons, galvanic corrosion, current flow and direction, ICCP systems and reverse polarity. The time allowed shall be 120 minutes.

Details of the examination syllabus are given in Appendix 1.

2.3 Cathodic Protection Senior Inspector

Cathodic Protection Senior Inspector candidates are required to take theoretical and practical examinations.

The theoretical examination consists of a minimum of 40 questions, of which 35 shall be multiple choice and five shall be narrative questions which require explanatory sketches/answers of CP situations. The time allowed shall be 120 minutes.

The theoretical examination may also be supplemented by an oral examination.

The practical examination is comprised of two CP design questions, one offshore and the other onshore. The time allowed shall be 120 minutes.

Details of the examination syllabus are given in Appendix 1.

2.4 Application for examination and fees

Candidates will be required to submit an application form and CV. All requested information 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 CVs any examination undertaken will be declared null and void. A certificate is invalidated automatically if there are any outstanding examination fees in respect of that certificate.

Candidates proved to have cheated, or found to have attempted to remove, or found to have removed, examination material in a CSWIP examination will not be accepted as a candidate for any CSWIP examination for a minimum of five years from the date of the examination where cheating, attempt to remove, or removal, of examination material was established to have taken place.

3 CERTIFICATION

3.1 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.

3.2 Successful candidates

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

3.3 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 examination; otherwise, candidates will have to repeat the complete examination.

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

3.4 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 3.5.1. 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 logo
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.

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

3.5 Renewal

3.5.1 Five year renewal

In order for the certificate to be renewed after five years, the holder has to demonstrate that they have maintained their competence by:

i) providing evidence of continuous work activity in cathodic protection

ii) providing evidence that the holder has kept up to date in cathodic protection technology.

Part i) can be satisfied by submitting a log sheet of relevant work activity covering the period of validity of the certificate. Requests for the appropriate documentation should be made to TWI Certification Ltd. Contact details are given at the end of the document.

The certificate will not be renewed without further test if an authenticated complaint is received by the Governing Board during the period of its 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 holder's 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**.**

3.5.2 Ten year recertification

Certificates are renewed beyond ten years from the initial examination (or from a previous ten year renewal) by the holder successfully completing a recertification examination prior to the expiry of the certificate, in addition to the renewal procedure given in Clause 3.5.1. Requests for the appropriate documentation should be made to TWI Certification Ltd only. Contact details are given at the end of the document.

The ten year recertification examination will consist of the following:

a) **Cathodic Protection Data Collector**

A theoretical examination as per the initial examination contained in Clause 2.1.

b) **Cathodic Protection Inspector**

A theoretical examination as per the initial examination contained in Clause 2.2.

c) **Cathodic Protection Senior Inspector**

A theoretical examination as per the initial examination contained in Clause 2.3. This may be supplemented by an oral examination.

At all levels one retest within six months of the ten year recertification examination will be allowed.

Failure by candidates at any level at the retest point will require the candidate to take the full course and initial examination again to regain the applicable level of certification.

3.6 Complaints and appeals

An aggrieved party in a dispute that considers itself to have reasonable grounds for questioning the competency of a CSWIP certified 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.

4 RECORDS

TWI Certification Ltd maintains records of successful and unsuccessful candidates. These records are accessible to the Governing Board or its nominees at all reasonable times.

5 REFERENCES

ISO 17024	Conformity assessment. General requirements for bodies operating certification of persons
ISO 15257	Cathodic protection. Competence levels of cathodic protection persons. Basis for a certification scheme

6 ADDRESSES

For further general information contact:

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United Kingdom

Phone: +44 (0) 1223 899000
E-mail: personnel@twicertification.com
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For specific information on examinations and tests, and arranging for them to be carried out, contact the Examining Body:

TWI Training and Examination Services
Granta Park
Great Abington
Cambridge
CB21 6AL
United Kingdom

Phone: +44 (0) 1223 899500
E-mail: trainexam@twi.co.uk
Website: https://www.twitraining.com/

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Appendix 1: Examination Syllabus

APPENDIX 1: EXAMINATION SYLLABUS

1 Level 1 - Cathodic Protection Data Collector

1.1 Examination format (see section 2.1 of the main document)

- 30 multiple-choice questions
- Time allowed: 120 minutes
- Pass mark: 70%

1.2 Examination syllabus

Candidates will need to demonstrate their knowledge of:

- basic fundamentals of electricity
- basic fundamentals of corrosion
- CP terminology
- reference or half cells
- galvanic effects
- polarisation diagrams
- soil/water (electrolyte) resistivity
- principle of coating of buried or immersed structures
- sacrificial and impressed current systems
- basics of CP systems
- CP materials (anodes, transformer rectifier units, insulating joints, etc.)
- criteria for protection (protective potentials)
- safety aspect of CP systems
- pipe (or structure) to soil (or water) potential measurements
- monitoring and maintenance of CP systems
- limitations of CP.

2 Level 2 - Cathodic Protection Inspector

2.1 Examination format (see section 2.2 of the main document)

Theoretical examination

- 35 multiple-choice questions
- Time allowed: 120 minutes
- Pass mark: 70%

Practical examination

- A minimum of 5 measurement reports
- Time allowed: 120 minutes
- Pass mark: 70%

2.2 Examination syllabus

In addition to the knowledge requirements for Cathodic Protection Data Collector, candidates will need to demonstrate their knowledge of:

- criteria for CP and their limitations
- Pourbaix diagram interpretation
- surface film effects (oxide layers)
- CP design considerations for sacrificial anode and impressed current systems
- CP materials, specification and quality control

- safety considerations
- concept of attenuation
- commissioning a CP system
- On and Off instant potentials
- 'IR drop' error
- CP systems for specific installations (tank farms, maritime, process plant, pipelines, jetties and offshore installations)
- CP and protective coatings
- inspection of pipeline coatings.

3 Level 3 - Cathodic Protection Senior Inspector

3.1 Examination format (see section 2.3 of the main document)

Theoretical examination

- 35 multiple-choice questions and 5 narrative questions (total 40)
- Time allowed: 120 minutes
- Pass mark: 70%

The theoretical examination may also be supplemented by an oral examination.

Practical examination

- 2 design solutions (1 onshore and 1 offshore)
- Time allowed: 120 minutes
- Pass mark: 70%

3.2 Examination syllabus

In addition to the knowledge requirements for Cathodic Protection Data Collector and Cathodic Protection Inspector, candidates will need to demonstrate their knowledge of:

- design of onshore and offshore CP systems
- problem areas and troubleshooting of CP systems
- investigation of test posts or stations
- insulating flanges and monoblocks
- low potential readings
- high potential readings
- On and Off potential readings
- interference effects and mitigation
- AC and DC (stray current) effects
- earthing, complex structures
- coatings and CP problems
- holiday detection
- current attenuation
- auditing of CP systems
- rehabilitation of CP systems
- CP in different applications.