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Cathodic protection — Competence levels of cathodic protection persons — Basis for a certification scheme

Protection cathodique — Niveaux de compétence des personnes en protection cathodique — Base pour un dispositif particulier de certification

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 156, *Corrosion of metals and alloys*.

Introduction

This document enables the competence of cathodic protection (CP) persons carrying out cathodic protection survey, design, installation, testing and maintenance work to be defined and verified.

The relevant application sectors concern on-land metallic structures, marine metallic structures, reinforced concrete structures and the inner surfaces of metallic structures containing an electrolyte.

Demonstration of competence is possible by certification. This document offers a certification scheme in accordance with ISO/IEC 17024.

In preparation of Clauses 4, 5 and 6, a detailed job task analysis (JTA) was undertaken by consensus of the experts in ISO TC 156. This JTA was then subject to review by international experts during the ISO enquiry process. It is considered that Clauses 4, 5 and 6 constitute a rigorous JTA. The JTA is largely based on similar work performed by CEN/TC 219, which produced EN 15257, which has been in widespread use since 2007.

Cathodic protection — Competence levels of cathodic protection persons — Basis for a certification scheme

1 Scope

This document defines five levels of competence (detailed in Clause 4) for persons working in the field of cathodic protection (CP), including survey, design, installation, testing, maintenance and advancing the science of cathodic protection. It specifies a framework for establishing these competence levels and their minimum requirements.

Competence levels apply to each of the following application sectors:

— on-land metallic structures;

— marine metallic structures;

— reinforced concrete structures;

— inner surfaces of metallic structures containing an electrolyte.

These application sectors are detailed in Clause 5.

This document specifies the requirements to be used for establishing a certification scheme as defined in ISO/IEC 17024. It is not mandatory to apply all of the levels and/or application sectors. This certification scheme is detailed in Annexes A, B and C.

2 Normative references

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

ISO/IEC 17024, *Conformity assessment — General requirements for bodies operating certification of persons*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8044 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
application sector
particular section of industry or technology where specialized cathodic protection survey, design, installation, testing and maintenance practices are used or the science of cathodic protection is advanced, requiring specific sector-related knowledge, skill, equipment or *training* (3.13)

3.2
assessment committee
group appointed by the certification body which reviews applications and examination results and determines compliance with the requirements for CP certifications offered by the certification body

3.3
CP person
cathodic protection person
person who devotes a regular and significant percentage of professional activity to the practical application of cathodic protection within one or more of the *application sectors* (3.1)

3.4
competence
ability to apply knowledge and skill to achieve intended results

Note 1 to entry: Within the scope of this document, the ability of *CP persons* (3.3) means to apply defined knowledge and defined skills and undertake defined tasks at specific levels and specific *application sectors* (3.1).

3.5
complex structure
system comprising the structure to be protected connected to one or more foreign electrodes and/or crossing multiple connected electrodes or passing close or through steel-reinforced concrete

EXAMPLE Steel in concrete and earthing installations are examples of foreign electrodes.

3.6
examination centre
place for the examination of *competence* (3.4) in cathodic protection

Note 1 to entry: The centre includes testing facilities to simulate the conditions that normally exist in real cathodic protection of operating industrial structures for a given *application sector* (3.1).

3.7
examiner
person with relevant technical and personal qualifications, and competent to conduct and/or score an examination

3.8
industrial cathodic protection experience
practice in the applicable cathodic protection techniques and *application sector(s)* (3.1) concerned, which leads to the required skill and knowledge

3.9
significant interruption
period of time in which a *CP person* (3.3) has not practised the duties or undertaken *training* (3.13) corresponding to their level of *competence* (3.4) within an *application sector* (3.1)

Note 1 to entry: A significant interruption comprises a continuous period in excess of 1,5 years or two or more periods for a total time exceeding 3 years during the validity of the certificate.

3.10
simple CP system
simple cathodic protection system
cathodic protection system with no design constraints due to external electrical influences, foreign structure interaction or unpredictable electrolyte changes where the design follows identified and defined, auditable procedural steps as developed by a person certificated to Level 4

3.11
technical instruction
written description, method statement or work instruction stating the precise steps to be followed in a cathodic protection survey, design, installation, testing or maintenance activity to an established standard, code, specification or cathodic protection procedure

3.12
technical report
written report intended to transmit engineering information of a complex, analytical nature

3.13
training
theoretical and practical instructions given in conformity to a pre-established programme in order to furnish or increase the knowledge and the ability of *CP persons* (3.3) in cathodic protection activities

3.14
training centre
centre where *training* (3.13) of *CP persons* (3.3) is carried out

Note 1 to entry: The training centre includes demonstration and testing facilities to simulate the electrical conditions that normally exist in real cathodic protection of operating industrial structures for a given *application sector* (3.1).

4 Levels of competence

4.1 General

The competence of CP persons shall be classified in one or more of the following levels, depending on their competence in particular application sectors.

A detailed description of the requirements of competence is given in Clause 6.

Each defined level of competence shall include also the competence of the corresponding lower levels.

4.2 Level 1, cathodic protection data collector (or tester)

Level 1 CP persons shall be competent to collect CP performance data of simple CP systems and perform other basic CP tasks in accordance with technical instructions and procedures produced by Level 3 or higher persons and record the data to a format produced by Level 3, or higher persons and under their responsibility. Level 1 persons shall not be responsible for analysing the data. Level 1 persons shall understand the fundamentals of the measurements that they are required to undertake, the common causes of errors in these measurements and the related safety issues. The measurements shall include routine system function measurements, as well as a limited number of specific measurements to determine the performance effectiveness of CP systems.

4.3 Level 2, cathodic protection technician

In addition to the competencies for Level 1 CP persons, Level 2 CP persons shall be competent to undertake a range of CP measurement, inspection and supervisory activities in accordance with technical instructions and procedures produced by Level 3 or higher persons, and collate and classify the data under their responsibility.

Level 2 persons shall have knowledge of the fundamentals of electricity, corrosion, coatings, CP and measurement techniques, safety issues and applicable standards related to CP.

Level 2 persons shall be competent to check the calibration validity of the CP measuring and testing equipment, supervise and perform inspection and testing during installation of CP systems and carry out routine maintenance work on CP systems.

Level 2 persons shall not be responsible for the choice of test method, the technique to be used, preparing the technical instructions or the interpretation of test results.

4.4 Level 3, cathodic protection senior technician

In addition to the competencies for Level 2 persons, Level 3 persons shall have knowledge of the general principles of corrosion and CP, the principles of electricity, the significance of coatings and their influence on CP and a detailed knowledge of CP test procedures and safety issues.

Level 3 persons shall understand and be competent to perform CP tasks according to established or recognized procedures. They shall be competent to carry out and supervise all Level 1 and Level 2 duties, provide guidance for persons at Level 1 and Level 2. They shall be competent to prepare technical instructions for all CP persons of lower-level competence and assess all data collected from these tasks.

4.5 Level 4, cathodic protection specialist

In addition to the competences for Level 3 persons, Level 4 persons shall have detailed knowledge of corrosion theory, principles of electricity, CP design, installation, commissioning, testing and performance evaluation, including systems affected by interfering conditions. They shall have competence in establishing testing and performance criteria where none are otherwise available. They shall have a general familiarity with CP in all application sectors.

They shall be competent to design CP systems including those where no pre-set parameters or procedural steps exist. They shall be competent to define the guidelines for specifying, designing and monitoring CP systems. They shall be competent to consider technical and safety aspects.

They shall be competent to prepare technical instructions for all CP persons of lower-level competence and assess all data collected from these tasks.

In all of these activities, Level 4 persons are not required to be supervised by Level 5 or other persons.

4.6 Level 5, cathodic protection expert

In addition to the competencies for Level 4 persons, Level 5 CP persons shall have advanced the state of the art of CP by scientific work and peer-reviewed publications and shall have made a marked and original contribution to the science or practice of corrosion control by CP.

Level 5 persons shall have all the competences required in Clause 6 for Level 4 persons in at least one sector and shall have detailed knowledge of CP and a range of competences in all sectors. They shall have in at least one of the sectors an established and mature reputation as a CP specialist at the highest level. Level 5 persons shall undertake a range of high-level activities such as management of R&D projects, publications in technical or scientific journals or books, lectures at congresses or training courses, participation in standardization or technical committees, lead in the development of new technology or new applications, editing scientific journals and/or other activities as described in B.5.

It is not precluded for Level 4 persons to perform any of the tasks attributed to Level 5.

It is not a requirement that certification bodies, examination centres or training centres utilize Level 5 CP persons in the operation and management of their activities.

4.7 Designation of competence levels

Levels 1 to 5 are the definitive terms. The terms cathodic protection tester, cathodic protection technician, cathodic protection senior technician, cathodic protection specialist and cathodic protection expert are used above in an indicative purpose only.

5 Application sectors

5.1 General

Any of the following application sectors shall be used in the establishment of competence levels of CP persons. For each of the application sectors (see 5.2 to 5.5), national and international specific standards may apply.

In addition to the specific knowledge for each application sector, a common core of knowledge is required.

5.2 On-land metallic structures

The following topics are relevant to this application sector:

— CP general principles and specific applications in soils and waters;

— CP measurement techniques;

— protection against corrosion by stray current from direct current systems;

— interference from alternating and direct current;

— the relevance of touch potentials.

This application sector includes, for example, the following:

a) buried onshore pipelines;

b) sections of onshore pipelines crossing rivers, lakes or short lengths of sea;

c) landfalls of offshore pipelines protected by an onshore CP system;

d) buried tanks;

e) bottoms (external side) of above-ground tanks;

f) complex structures (see 3.5);

g) well casings;

h) buried plant modules.

5.3 Marine metallic structures

The following topics are relevant to this application sector:

— CP general principles;

— CP measurement techniques;

— specific applications in seawater and marine sediments.

This application sector includes, for example, the following:

a) ships (external hulls and ballast tanks filled with sea water);

b) CP measurement techniques;

c) fixed offshore structures (platforms, jackets, monopiles, offshore windfarms, tension leg platforms, etc.);

d) floating structures [buoys, semi-submersible platforms, floating production storage and offloading structures (FPSO)];

e) underwater structures (well heads, manifolds, piping);

f) coastal and offshore pipelines, risers;

g) landfall of offshore pipelines protected by an offshore CP system;

h) harbour facilities, piers, jetties and lock gates.

5.4 Reinforced concrete structures

The following topics are relevant to this application sector:

— CP general principles;

— CP measurement techniques;

— specific applications of steel in concrete;

— other electrochemical techniques that are also aimed at mitigating corrosion of steel embedded in concrete, such as electrochemical re-alkalization and chloride extraction treatments for reinforced concrete.

This application sector includes, for example, the following:

a) atmospherically exposed steel-reinforced (both post-tensioned and pre-stressed) concrete, onshore structures (bridges, walls, piles, buildings etc.);

b) buried steel-reinforced (both post-tensioned and pre-stressed) concrete structures (pipelines, tunnels, foundations, etc.);

c) steel-reinforced (both post-tensioned and pre-stressed) concrete structures immersed in fresh water (pipe lines, foundations, swimming-pools, water tanks);

d) steel-reinforced (both post-tensioned and pre-stressed) concrete structures immersed in seawater (harbour facilities, piers, jetties, offshore platforms).

5.5 Inner surfaces of metallic structures containing an electrolyte

The following topics are relevant to this application sector:

— CP general principles;

— specific applications of inner surfaces;

— CP measurement techniques.

This application sector includes, for example, the following:

a) fresh water containing equipment (storage tanks, condensers, filters, cooling water systems, etc.);

b) seawater-containing equipment (ballast tanks, flooded dock gates, flooded compartments, flooded piles, cooling water systems, etc.);

c) oil field production water storage tanks;

d) offshore immersed pumps and the internals of their caissons;

e) inside offshore windfarm monopiles;

f) other electrolyte-containing equipment (tanks and piping).

6 Requirements for competence of persons at various levels and for various applications sectors

6.1 General

CP persons of competence Levels 1 to 4 shall be knowledgeable in the topics in Table 1 and competent to undertake the tasks detailed in Table 2 to Table 6. CP persons shall have the knowledge and skill

to properly and safely undertake these tasks, to understand their purposes, to recognize possible problems with their execution and the significance of the data arising from them.

All work by Level 1 and Level 2 CP persons shall be according to technical instructions issued by CP persons of Level 3 or higher.

CP persons of a particular level may assist in tasks at higher levels than defined in Table 2 to Table 6 corresponding to their application sector and competence level for their level alongside and under the direct supervision of a CP person of the higher level. The higher level person retains the responsibility for the work performed by the lower-level person.

CP persons of a particular level may undertake without direct supervision tasks at one level higher than defined in Table 2 to Table 6 for their level provided they shall have received additional documented training and assessment for the particular task by a CP person of the higher level. This assessment and documentation may be undertaken within a corporate system.

Each defined level of competence shall include also the competence of the corresponding lower levels.

6.2 Knowledge required for all application sectors and all levels

The knowledge detailed in Table 1 constitutes a common core for all application sectors and all levels.

Table 1 — Knowledge required by persons for all competence levels and all application sectors

Knowledge number	Description of knowledge
1	Electricity relevant to CP application and measurements
2	Corrosion, electrochemistry and coatings relevant to CP
3	Theory, principles and criteria of CP
4	Requirements related to application of CP
5	Application methods of CP, galvanic anodes, impressed current
6	CP measurements and test procedures
7	Relevance of voltage gradient errors and influence on structure to electrolyte potential measurement
8	Factors influencing the correct selection of reference electrodes for potential measurements
9	Effects of excessive CP on coatings, high-yield strength steels and corrosion-resistant alloys
10	Diagnostics of CP systems
11	Interference conditions (alternating current and direct current)
12	Standards and codes of practice in the relevant application sector

The level of knowledge in Table 1 shall be progressively increased from Level 1 to Level 4 to conform to the levels of competency defined in Clause 4, and the tasks in 6.3 to 6.8.

6.3 Tasks to be fulfilled in all application sectors for Levels 1 to 4

Table 2 details the tasks for each level of competence from 1 to 4 whatever the application sector. Persons shall be competent in these tasks for their particular application sector.

Table 2 — Tasks to be fulfilled by the various competence levels for all application sectors

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
1	Prepare technical reports	No	No	No	Yes
2	Prepare technical instructions	No	No	Yes	Yes
3	Collect general information for design purposes based on technical instructions for simple CP systems (as defined in 3.10)	No	Yes	Yes	Yes
4	Collect detailed information and data for design purposes	No	No	Yes	Yes
5	Check calibration validity of CP measuring and testing equipment based on documentation	Yes	Yes	Yes	Yes
6	Measure structure to electrolyte potential	Yes	Yes	Yes	Yes
7	Perform verification test of working portable reference electrode against master electrode of the same type based on measurement	Yes	Yes	Yes	Yes
8	Perform verification test of working portable reference electrode against another type of reference electrode	No	Yes	Yes	Yes
9	Perform verification test of stationary reference electrode against a portable reference electrode	No	Yes	Yes	Yes
10	Perform pre-commission testing	No	Yes	Yes	Yes
11	Check whether the positive output of the rectifier is connected to the anode and the negative output is connected to the structure	No	Yes	Yes	Yes
12	Identify a wrong polarity of the CP system by structure to electrolyte potential measurement	Yes	Yes	Yes	Yes
13	Perform start-up and commissioning	No	No	Yes	Yes
14	Record and report results of the measurements in a comprehensible format	Yes	Yes	Yes	Yes
15	Classify the results of the measurements	No	Yes	Yes	Yes
16	Define the limitations of application of the testing method according to established procedures	No	No	Yes	Yes
17	Interpret commissioning or performance verification data and prepare commissioning report, performance verification report or system review report for simple CP systems (as defined in 3.10)	No	No	Yes	Yes
18	Interpret commissioning or performance verification data and prepare commissioning report, performance verification report or system review report for non-simple CP systems (simple CP systems are defined in 3.10)	No	No	No	Yes
19	Measure current and voltage in the CP circuit	Yes	Yes	Yes	Yes
20	Carry out basic maintenance work on CP systems	Yes	Yes	Yes	Yes
21	Inspect and measure of DC power supply output current and voltage	Yes	Yes	Yes	Yes
22	Inspect and verify DC power supply overall operations	No	Yes	Yes	Yes

Table 2 *(continued)*

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
23	Inspect and maintain DC power supply output terminations if accessible without exposing persons to live AC equipment	Yes	Yes	Yes	Yes
24	Inspect and maintain DC power supply components	No	Yes	Yes	Yes
25	Verify DC power supply voltage and current outputs with portable calibrated meter	Yes	Yes	Yes	Yes
26	Routine and expected adjustment of current output to maintain pre-determined performance	No	Yes	Yes	Yes
27	Determine the validity of the data and analyse anomalies detected	No	No	Yes	Yes
28	Determine increase/decrease in current output to maintain optimum performance including remedial actions to correct anomalies and interferences	No	No	Yes	Yes
29	Ensure compliance with safety requirements related to application of CP in the application sector, task and competence level	Yes	Yes	Yes	Yes
30	Perform risk assessment of safety requirements related to application of CP in the application sector, task and competence level	Yes	Yes	Yes	Yes
31	Translate CP measuring and testing standards and specifications into technical instructions for CP measuring and testing, routine maintenance, and installations procedures	No	No	Yes	Yes
32	Investigate material weight loss corrosion when application of CP may be involved	No	No	Yes	Yes
33	Set up measuring and testing equipment and verify equipment settings	Yes	Yes	Yes	Yes
34	Investigate any case of material cracking when application of CP may be involved	No	No	No	Yes
35	Utilize new developments in science and technology of corrosion and CP along with field performance experience and participate in developing improvements to CP designs, operations, performance assessments and maintenance procedures	No	No	No	Yes
36	Write technical instructions for lower-level persons, supervise and train them in the practice of their tasks	No	No	Yes	Yes
37	Interpret and evaluate results in accordance with established standards, codes and specifications	No	No	Yes	Yes
38	Undertake, without supervision, simple CP system (as defined in 3.10) design works according to established procedures in a known environment	No	No	Yes	Yes
39	Establish technical instructions including definition of CP test procedure and equipment to be used and the format for reporting data for tasks covered in standards, codes and specifications	No	No	Yes	Yes

Table 2 *(continued)*

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
40	Establish technical instructions including definition of CP test procedure and equipment to be used and the format for reporting data for tasks not fully covered in standards, codes and specifications	No	No	No	Yes
41	Interpret and evaluate results from all tests performed outside the scope of established standards, codes and specifications	No	No	No	Yes
42	Undertake complex CP designs	No	No	No	Yes

Work on the AC mains, side of transformer rectifiers is specifically excluded from the competence requirements of all levels of personnel. Regulations, training and specific certifications apply for work on mains voltage equipment.

6.4 Specific tasks for on-land metallic structures application sector for Levels 1 to 4

Table 3 details the specific tasks for each competence level from 1 to 4 in the on-land metallic structures application sector.

Table 3 — Specific tasks for on-land metallic structures application sector

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
1	Measure metal to electrolyte natural (free corrosion) potential	Yes	Yes	Yes	Yes
2	Measure resistivity: four-pin Wenner	Yes	Yes	Yes	Yes
3	Measure resistivity: soil box methods	No	Yes	Yes	Yes
4	Measure resistivity: Schlumberger method	No	No	Yes	Yes
5	Calculate vertical resistivity distribution	No	No	Yes	Yes
6	Design simple CP systems. Examples are galvanic anode systems for small tanks in known soil conditions not affected by AC or DC stray current (as defined in 3.10)	No	No	Yes	Yes
7	Design non-simple CP systems (simple CP systems are defined in 3.10)	No	No	No	Yes
8	Supervise the preparation of metallic surface for making cable connections and for repairing coating	No	Yes	Yes	Yes
9	Supervise the installation of cable connections: bolting, compression and conductive adhesive	No	Yes	Yes	Yes
10	Supervise the installation of cable connections: soldered, exothermic welded, pin brazed	No	Yes	Yes	Yes
11	Supervise the installation of galvanic anodes	No	Yes	Yes	Yes
12	Supervise the installation of DC power supply (electrical AC supply excluded)	No	Yes	Yes	Yes
13	Supervise the installation of deep anode impressed current groundbeds	No	Yes	Yes	Yes
14	Supervise the installation of shallow impressed current anode groundbeds	No	Yes	Yes	Yes
15	Supervise the installation of isolation devices	No	Yes	Yes	Yes
16	Supervise the installation of reference electrodes (including calibration) and coupons	No	Yes	Yes	Yes

Table 3 *(continued)*

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
17	Supervise the installation of AC mitigation earthing electrodes and DC decoupling devices	No	Yes	Yes	Yes
18	Verify the electrical continuity of all parts of the structure to be protected	No	Yes	Yes	Yes
19	Locate protected structure and of foreign metallic structures including buried steel-reinforced concrete and electrical earthing systems	No	Yes	Yes	Yes
20	Inspect and test electrical isolation	No	Yes	Yes	Yes
21	Measure structure to electrolyte ON potential	Yes	Yes	Yes	Yes
22	Measure structure to electrolyte instant OFF potential	No	Yes	Yes	Yes
23	Measure structure to electrolyte potential depolarization	No	Yes	Yes	Yes
24	Report measurements including comparison of measurement results to a selected CP criteria according to procedure	No	Yes	Yes	Yes
25	Perform close interval potential survey (ON or natural)	No	Yes	Yes	Yes
26	Perform potential measurement of structure to remote earth	No	Yes	Yes	Yes
27	Perform close interval polarized potential survey (ON/instant OFF)	No	Yes	Yes	Yes
28	Establish synchronization of current interruptions for instant OFF measurements	No	Yes	Yes	Yes
29	Confirm synchronization of current interruptions for instant OFF measurements	No	Yes	Yes	Yes
30	Measure ON and IR free potential as well as DC and AC current on coupons	No	Yes	Yes	Yes
31	Measure potential gradients in soil	No	Yes	Yes	Yes
32	Intensive measurements (see ISO 15589-1)	No	No	Yes	Yes
33	Perform AC frequency current signal attenuation measurements	No	No	Yes	Yes
34	Perform direct Current Voltage Gradient (DCVG), non-recording	No	No	Yes	Yes
35	Perform direct Current Voltage Gradient (DCVG), with recording of digital measurements	No	No	Yes	Yes
36	Perform Pearson surveys (ACVG)	No	No	Yes	Yes
37	Perform interference testing and measurement under interference conditions from a static (not time variant) DC source	No	Yes	Yes	Yes
38	Perform interference testing and measurement under interference conditions from a dynamic (time variant) DC source	No	Yes	Yes	Yes
39	Analyse and treat DC interferences from a static (not time variant) source	No	No	Yes	Yes
40	Analyse and treat DC interferences from a dynamic (time variant) source	No	No	No	Yes
41	Analyse and treat AC interferences from a static (not time variant) source	No	No	No	Yes

Table 3 *(continued)*

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
42	Analyse and treat AC interferences from a dynamic (time variant)source	No	No	No	Yes
43	Supervise cable and connection repair	No	Yes	Yes	Yes
44	Test casings for isolation from carrier pipe	No	Yes	Yes	Yes
45	Perform visual inspection of simple components of CP systems (e.g. test posts)	Yes	Yes	Yes	Yes
46	Perform visual inspection of coating for physical damage	No	Yes	Yes	Yes
47	Perform detailed inspection of coating and structure for damage	No	No	Yes	Yes
48	Test CP effectiveness under disbonded coating	No	No	Yes	Yes
49	Collect soil samples and deposits from the structure for laboratory corrosion analysis	No	Yes	Yes	Yes
50	Perform basic chemical and microbiological field test	No	No	Yes	Yes
51	Measure extent of corroded area	No	No	Yes	Yes
52	Assess data and determine cause of corrosion and remedial action	No	No	No	Yes
53	Perform E-Log I survey	No	No	No	Yes
54	Perform potential surveys of buried pipelines across bodies of water (lakes, rivers, estuaries)	No	Yes	Yes	Yes
55	Perform current requirement test for pipelines, plants, horizontal directional drilling, etc.	No	No	Yes	Yes

6.5 Specific tasks for marine metallic structures application sector for Levels 1 to 4

Table 4 details the specific tasks for each competence level from 1 to 5 in the marine metallic structures application sector.

Table 4 — Specific tasks for marine metallic structures application sector

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
1	Design simple CP systems (as defined in 3.10) Examples are systems for buoys, small boats	No	No	Yes	Yes
2	Design non-simple CP systems (simple CP systems are defined in 3.10) Examples are systems for coastal, offshore and submarine facilities, floating production and storage structures, ships	No	No	No	Yes
3	Supervise installation of galvanic or impressed current anodes and monitoring systems	No	Yes	Yes	Yes
4	Supervise installation of DC power sources (AC power supply excluded)	No	Yes	Yes	Yes
5	Supervise installation of isolation devices	No	Yes	Yes	Yes
6	Verify the electrical continuity of all parts of the structure to be protected	No	Yes	Yes	Yes
7	Measure structure to electrolyte potential in seawater from surface with portable reference electrode	Yes	Yes	Yes	Yes

Table 4 *(continued)*

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
8	Measure structure to electrolyte potential in seawater from surface with monitoring systems (permanent reference electrodes and connection by cables or acoustic transmission)	Yes	Yes	Yes	Yes
9	Measure structure to electrolyte potential in seawater with portable reference electrode connected to measurement system on surface	Yes	Yes	Yes	Yes
10	Measure structure to electrolyte potential in seawater by combined measurement device including reference electrode, voltmeter and contact tip	Yes	Yes	Yes	Yes
11	Measure anode current output from surface using monitoring systems (monitored anodes and connection by cables or acoustic transmission)	Yes	Yes	Yes	Yes
12	Measure current output of stand-off anodes using underwater clamp meter	Yes	Yes	Yes	Yes
13	Measure potential gradient in seawater	No	Yes	Yes	Yes
14	Organize underwater potential and/or anode current output surveys for simple CP systems (as defined in 3.10) Examples are systems for buoys, small boats	No	No	Yes	Yes
15	Organize underwater potential and/or anode current output surveys for non-simple (simple CP systems are defined in 3.10) applications of the application sector	No	No	No	Yes
16	Analyse the results of potential and/or anode current output surveys for simple CP systems (as defined in 3.10) Examples are systems for buoys, small boats	No	No	Yes	Yes
17	Analyse the results of potential and/or anode current output surveys for non-simple (simple CP systems are defined in 3.10) applications of the application sector	No	No	No	Yes
18	Measure current and voltage in the CP circuit	Yes	Yes	Yes	Yes
19	Inspect and measure DC power sources output current and voltage	Yes	Yes	Yes	Yes
20	Inspect and verify DC power sources overall operations	No	Yes	Yes	Yes
21	Inspect and maintain DC power sources output terminations and check polarity	Yes	Yes	Yes	Yes
22	Verify DC power sources voltage and current outputs with portable calibrated meter	Yes	Yes	Yes	Yes
23	Interpret data	No	No	Yes	Yes
24	Review video record of inspection of structure and CP system with respect to physical damage, coating damage, corrosion damage	No	No	Yes	Yes
25	Supervise measurement of extent of underwater corroded area	No	Yes	Yes	Yes
26	Measure resistivity of seawater or mud with soil box	No	Yes	Yes	Yes
27	Measure resistivity of seawater by conductivity meter or salinity or chlorinity	No	Yes	Yes	Yes
28	Perform interference testing	No	No	Yes	Yes

6.6 Specific tasks for reinforced concrete structures application sector for Levels 1 to 4

Table 5 details the specific tasks for each competence level from 1 to 4 in the reinforced concrete structures application sector.

Table 5 — Specific tasks for reinforced concrete structures application sector

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
1	Test electrical continuity of reinforcement to allow accurate potential measurements	No	Yes	Yes	Yes
2	Measure steel to concrete natural potential in concrete	Yes	Yes	Yes	Yes
3	Measure “Half Cell Potential Survey” (close interval survey natural potential)	Yes	Yes	Yes	Yes
4	Process potential data for mapping	No	No	Yes	Yes
5	Locate reinforcement with cover meter	Yes	Yes	Yes	Yes
6	Measure cover to reinforcement with cover meter	No	Yes	Yes	Yes
7	Supervise or undertake the collection of concrete drilling dust or core samples for chloride testing	No	Yes	Yes	Yes
8	Interpret chloride analysis results	No	No	Yes	Yes
9	Test carbonation to broken or cored concrete	No	Yes	Yes	Yes
10	Measure concrete resistivity (two pin or four pin)	No	No	Yes	Yes
11	Inspect surface of reinforcement when exposed for corrosion or physical damage	No	No	Yes	Yes
12	Measure pit depth with suitable gauge	No	No	Yes	Yes
13	Inspect surface of pre-stressing steel when exposed for corrosion or physical damage	No	No	Yes	Yes
14	Design CP system and other electrochemical treatments	No	No	No	Yes
15	Measure reinforcement electrical continuity (resistance and potential techniques)	No	Yes	Yes	Yes
16	Supervise reinforcement electrical continuity bonding and retest	No	Yes	Yes	Yes
17	Supervise installation of cable connection to reinforcement or embedded/surface mounted metallic items: mechanical	No	Yes	Yes	Yes
18	Supervise installation of cable connection to reinforcement or embedded/surface mounted metallic items: exothermic/welded/pin brazed	No	Yes	Yes	Yes
19	Supervise installation of cable connection to pre-stressing steel	No	No	No	Yes
20	Supervise installation of anode systems: galvanic and impressed current	No	No	Yes	Yes
21	Supervise connections of cables to anodes and (if applicable to anode system) primary anode system installation into secondary anode system	No	Yes	Yes	Yes
22	Supervise installation of reference electrodes, sensors and coupons	No	No	Yes	Yes
23	Supervise installation of DC power supplies and monitoring system (electrical input AC excluded due to regulations/safety)	No	No	Yes	Yes
24	Measure anode to reinforcement isolation (resistance and potential techniques)	No	Yes	Yes	Yes

Table 5 *(continued)*

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
25	Measure anode circuit continuity or resistance	No	Yes	Yes	Yes
26	Measure cathode and test circuit continuity or resistance	No	Yes	Yes	Yes
27	Correct or remove anode to reinforcement short circuit	No	No	Yes	Yes
28	Set up synchronized current interruptions for instant OFF potential measurements	No	No	Yes	Yes
29	Measure ON and instant OFF potential and current at permanently installed reference electrodes and coupons	No	Yes	Yes	Yes
30	Measure ON and instant OFF potential and potential decay from instant OFF at permanently installed reference electrodes	No	Yes	Yes	Yes
31	Survey/measure potential decay from instant OFF over concrete surface using portable reference electrodes	No	Yes	Yes	Yes
32	Perform interference testing	No	No	Yes	Yes

6.7 Specific tasks for inner surfaces of metallic structures application sector for Levels 1 to 4

Table 6 details specific tasks for each competence level from 1 to 4 in the inner surfaces of metallic structures application sector.

Table 6 — Specific tasks for inner surfaces of metallic structures application sector

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
1	Measure resistivity of electrolyte: soil box	No	Yes	Yes	Yes
2	Measure resistivity of electrolyte: conductivity meter	Yes	Yes	Yes	Yes
3	Design simple CP system, e.g. a small, plane surface, open tank containing sea water with regular but slow water replenishment (as defined in 3.10)	No	No	Yes	Yes
4	Design a non-simple CP system (simple systems are defined in 3.10)	No	No	No	Yes
5	Design CP taking into account impact on CP performance and safety implications of anodic and cathodic reactions, producing gasses (notably hydrogen and chlorine) and changing pH	No	No	No	Yes
6	Supervise installation of galvanic anodes	No	Yes	Yes	Yes
7	Supervise installation of impressed current anodes and reference electrodes	No	Yes	Yes	Yes
8	Supervise installation of DC power supply (electrical AC supply excluded)	No	Yes	Yes	Yes
9	Supervise installation of isolation devices	No	Yes	Yes	Yes
10	Verify the electrical continuity of all parts of the structure to be protected	No	Yes	Yes	Yes
11	Supervise and verify cable connections	No	Yes	Yes	Yes
12	Inspect and measure isolation devices	No	Yes	Yes	Yes
13	Measure metal to electrolyte natural potential	Yes	Yes	Yes	Yes

Table 6 *(continued)*

Task number	Description of task	Level 1	Level 2	Level 3	Level 4
14	Measure metal to electrolyte ON potential	Yes	Yes	Yes	Yes
15	Measure metal to electrolyte instant OFF potential	No	Yes	Yes	Yes
16	Set up and confirm synchronized current interruptions for instant OFF measurements	No	Yes	Yes	Yes
17	Measure ON potential and current as well as IR free potential on coupons	No	Yes	Yes	Yes
18	Test interference	No	No	Yes	Yes
19	Verify DC power supply voltage and current outputs with portable calibrated meter	Yes	Yes	Yes	Yes
20	Perform visual inspection of CP system components (e.g. galvanic anodes) with respect to damage	Yes	Yes	Yes	Yes
21	Perform visual inspection of vessel and coating with respect to physical and corrosion damage	No	No	Yes	Yes
22	Comply with the hygienic requirements on products and materials in case of contact with drinking water	Yes	Yes	Yes	Yes

6.8 Requirements for Level 5 CP persons

Level 5 persons shall have all the knowledge and skills required of Level 4 persons in the application sector of interest, plus a broad range of competence in all sectors and the knowledge and competence necessary to lead advances in the science, technology and practice of cathodic protection as described in 4.6 and B.5.

They shall be able to manage R&D projects dealing with CP in at least one application sector.

They shall be able to develop new technologies related to CP or new applications of existing CP systems.

Level 5 CP persons shall meet the following conditions:

a) have at least the competence of Level 4 in the same application sector;

b) have detailed knowledge of corrosion and CP and a broad range of competences in all sectors;

c) have made substantial contributions to the development of CP technology, e.g. through technical lead in the development in new technologies and applications of CP, published research results or long-term membership in acknowledged standardization committees;

d) have the competence to lead advances in science and technology in the applications in CP practice and corrosion control and have made a marked and original contribution to the science or practice of corrosion control by CP.

Annex A
(normative)

Certification scheme: Eligibility for competence assessment for Levels 1 to 4

A.1 General

The eligibility of CP persons for competence assessment shall be demonstrated in sufficient detail by documentation giving personal information which includes a declaration of education, training and experience.

The competent CP person shall fulfil the requirements for CP practical experience as defined in this annex and shall pass the relevant assessment as detailed in Annex B.

A.2 Industrial experience

The minimum requirements for duration of CP experience to be gained prior to certification shall not be less than that indicated in Table A.1 to Table A.3. The time in these tables refers to a minimum of 20 % activity in CP.

Table A.1 is for candidates without previous CP certification to the knowledge and tasks as detailed in Clause 6.

Table A.2 is for candidates with previous CP certification in the same application sector to the knowledge and tasks as detailed in Clause 6.

Table A.3 is for candidates with a certification to the knowledge and tasks as detailed in Clause 6 in one (or more) application sector(s) and are making application for certification of the same level in a different application sector.

Table A.1 — Minimum education and experience requirements for each level for candidates with no previous certification for the specific application sector

Target level	Education	Minimum experience in CP (years)
1	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	0
	Technical education	0
	Other education (requires basic mathematical skills)	0
2	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng Level or significant post graduate corrosion study or research)	1
	Technical education	1
	Other education (requires basic mathematical skills)	1
3	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	2
	Technical education	3
	Other education (requires basic mathematical skills)	4
4	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	5
	Technical education	8
	Other education (requires basic mathematical skills)	12

“Other education” includes candidates who may have had no formal post-school education or whose post-school education does not include relevant scientific or engineering content.

Table A.2 — Minimum education and additional experience requirements for each level for candidates with previous certification in the same application sector

Starting level	Target level	Education	Minimum additional experience in CP following previous certification in same sector (years)
1	2	All levels of education	1
1	3	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	2
		Technical education	3
		Other education (requires basic mathematical skills)	4
2	3	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	1
		Technical education	2
		Other education (requires basic mathematical skills)	3
2	4	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	4
		Technical education	7
		other education (requires basic mathematical skills)	11
3	4	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	3
		Technical education	5
		Other education (requires basic mathematical skills)	8

Table A.3 — Minimum education and experience requirements for each level for candidates with previous certification in a different application sector of the same level

Target level	Education	Minimum experience in CP in new sector for which application is being made (years)
1	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	0
	Technical education	0
	Other educations (requires basic mathematical skills)	0
2	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	0,5
	Technical education	0,5
	Other educations (requires basic mathematical skills)	0,5
3	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	1,5
	Technical education	2
	Other educations (requires basic mathematical skills)	3
4	Relevant engineering or scientific discipline degree (BSc, BEng or equivalent) and specialized education in the corrosion field (significant corrosion content at BSc or BEng level or significant post graduate corrosion study or research)	1,5
	Technical education	2
	Other educations (requires basic mathematical skills)	3

Candidates of a higher level in one sector can apply for a lower level in another sector and shall comply with the minimum requirements in Table A.3 in the new sector.

A.3 Training

A.3.1 Training for Levels 1, 2 and 3

CP persons shall provide documentary proof that they have completed a period of training in the application sector and level. The training period, method and syllabus shall be sufficient in order to deliver the knowledge and skill as detailed in Clause 6. Documentation may be retrospective. Training may be by the employer or through recognized course(s) at a training centre or by self-study.

The training shall be supported by Level 3 or higher CP persons.

The minimum duration of training that shall be undertaken is as follows.

a) Level 1: Two days of formal or documented on-the-job training in each particular application sector.

b) Level 2 and Level 3: Five days of formal or documented on-the-job or documented moderated self-study training in each particular application sector and for each level.

c) CP persons without Level 2 competences shall undertake a minimum of 10 days training for Level 3.

At all levels, training days shall include both practical and theory components.

A.3.2 Training centre for Levels 1, 2 and 3

The establishment of a training centre is not mandatory. A training centre may be situated at an employer's premises or independently.

a) A training centre may be established for one or more application sectors.

b) A training centre shall provide the following components, any of which may be combined:

   i) demonstration and testing facilities to simulate the electrical conditions that normally exist in real CP of operating industrial structures, for the appropriate application sector(s);

   ii) a classroom having appropriate equipment and facilities for teaching the theoretical principles;

   iii) a workshop or demonstration area with appropriate equipment and facilities, which shall be equipped with CP instruments, materials and samples for practical training and testing.

Up-to-date calibration certificates and repair records for all devices, instrumentation and equipment shall be maintained by the training centre. All devices, instrumentation, equipment, test leads and reference electrodes shall be maintained in good condition.

Training shall be delivered by persons at or above the level of the training being delivered.

A.3.3 Training for Level 4

Taking into account the required scientific and technical competence of Level 4 CP persons, preparation for Level 4 competence may be by, for example, the following:

a) completing a relevant engineering or scientific degree or period of post graduate education at a school of higher education;

b) attending training courses, conferences or seminars (such as those organized by established industrial or independent associations);

c) studying scientific or engineering text books, periodicals and other specialized materials.

The training period, method and syllabus shall be sufficient in order to deliver the knowledge and skill as detailed in Clause 6.

Level 4 CP persons shall keep documentary evidence of training, experience, theoretical knowledge, continued professional development and practical skills in CP to enable an assessment of competence.

Annex B
(normative)

Certification scheme: Examination and assessment

B.1 General

Bodies performing certification of the competence levels of CP persons shall be in accordance with ISO/IEC 17024 and shall establish a certification scheme as defined in that International Standard.

Demonstration of competence shall be achieved through examinations organized in an examination centre approved by the certification body.

B.2 Assessment committee

An assessment committee shall be established to review applications for certification, including examination results, application documentation, work history and other relevant information to determine the individual's competence and compliance with qualification requirements for any level.

The assessment committee shall be appointed by the certification body and shall consist of persons whose terms of reference are such that the confidence of all interested parties as to its competence, impartiality and integrity shall be maintained.

The assessment committee shall consist of at least three members, all of them having the same or higher certification level in the application sector of the examination to be assessed. All assessment committee members shall be minimum Level 3 and there shall be at least two of Level 4 in that application sector. The assessment committee members can be adjusted as needed based on the level and application sector being considered.

B.3 Examination and assessment for Levels 1 to 4

B.3.1 General

The examination system shall be established and maintained in order to assess the competence in accordance with Clause 6.

A sample of the knowledge and tasks listed in Clause 6 shall be assessed either by practical or theoretical examination.

For each level, the examination shall comprise three examination sessions. Two examination sessions shall be theoretical: the so-called "common-core examination session", applicable to CP generally, and the so-called "sectoral theoretical examination session", specific to each application sector. In addition, the examination shall be completed by a "sectoral practical examination session" specific to each application sector.

B.3.2 Examination centre

An examination centre shall

a) have adequately qualified staff, suitable premises and sufficient equipment to ensure successful examinations for the levels and application sectors concerned,

b) apply a documented quality management procedure,

c) have the resources needed to administer examinations, including the calibration and control of any equipment used,

d) prepare and conduct examinations under the responsibility of examiner(s),

e) use only test facilities suitable for the practical examinations conducted at that centre, and

f) include testing facilities to simulate the electrical conditions that normally exist in real CP of operating industrial structures for a given application sector.

Examinations and their assessments shall be independent of the employer and the training of CP persons.

B.3.3 Common-core examination session for Levels 1 to 4

The common-core examination session shall enable candidates to demonstrate the general knowledge that are applicable to all sectors. Questions that are not related to all sectors shall be covered in the relevant sectoral theoretical examinations in accordance with 6.2.

The time allowed to candidates for the completion of each examination shall be based upon the number and difficulty of the questions.

B.3.4 Sectoral theoretical examination session for Levels 1 to 4

The sectoral theoretical examination session shall require candidates to demonstrate their knowledge and competence to undertake tasks used within the application sector in question in accordance with Clause 6.

The sectoral theoretical examination session shall include a series of written questions on the processes and testing procedures used within the relevant application sector.

The sectoral theoretical examination session shall include only questions related to the application sector concerned.

The time allowed for candidates to complete each examination shall be based upon the number and difficulty of the questions.

B.3.5 Sectoral practical examination session for Levels 1 to 4

A sectoral practical examination session organized on structures or simulated structures and systems shall be provided. Candidates shall be required to demonstrate their competence to fulfil the requirements of Clause 6.

B.3.6 Conduct of examinations

At the examination, candidates shall present valid and unambiguous proof of identification (e.g. an identity card, passport or driving licence that includes a photograph) and an official notification of the examination, which shall be shown to the examiner or invigilator upon demand.

Examinations shall be evaluated and approved by at least one examiner.

At least one examiner shall be responsible for grading the examination.

Examiners shall be impartial in accordance with ISO/IEC 17024. The risk resulting from the following situations has to be assessed and mitigated for example if:

— the examiner has trained that person in the past two years;

— the examiner is employed in the same company;

— the examiner has a business relationship with the candidate.

The examiners shall attest their independence in the assessment of the candidates and that all information received in the assessment process shall be maintained in confidence.

B.3.7 Grading of examination for Levels 1 to 4

At least one examiner shall be responsible for the grading of the examinations by comparison with model answers.

The common-core, sectoral theoretical and practical examination sessions shall be graded separately. Each examination session and the overall examination shall have minimum pass grades in order that the theoretical knowledge and the practical competence required in Clause 6 are properly verified.

Candidates shall successfully complete each of the examination sessions.

The relative weighting of common core and sectoral exams may vary between levels and application sectors as deemed necessary. For example, the examination marking scheme should ensure that there is equal or greater weight allocated to the sectoral practical examination session in Level 1 and Level 2 than the theoretical examinations. For Level 3 and Level 4, the theoretical examinations should have equal or greater weight than the sectoral practical examination session.

In order that a candidate can be certified, the final grades on each examination shall be not less than the minimum score established by the certification body. The required passing scores shall be based on the difficulty of the examination process and the functionality required by industry of the persons considered to have passed the examinations. The minimum passing scores for each exam may be different.

The written tests of the common-core part shall be marked separately in order to allow candidates to apply, without re-sitting the common-core part, for another application sector.

Theoretical examination sessions may be administered together, but shall be graded separately.

B.3.8 Final assessment for Levels 1 to 3

Final assessment of competence of candidates shall be made by the assessment committee, which shall ensure the candidate's compliance with all requirements, including Annex A.

B.3.9 Assessment for Level 4

The competence of Level 4 CP persons, in accordance with all aspects detailed in Clause 6, shall be assessed by the assessment committee on the basis of a dossier detailing and documenting the following:

— educational, scientific or engineering qualifications of CP persons;

— extent of responsible experience in the particular application sector;

— examples of design documents, reports or technical papers prepared by CP persons;

— additional information offered by the candidate or as may be required by the certification body in order to document and demonstrate competence.

The dossier shall include technical instructions by a minimum of two independent CP persons with a competence of at least Level 4 familiar with the work of CP persons who shall attest to the veracity and accuracy of the dossier.

B.3.10 Re-assessment

Candidates adding a new application sector at the same competence level shall be required to re-sit only for the sectoral theoretical and practical examination sessions concerning the new application sector.

Candidates failing for reasons of unethical behaviour shall wait for a period of time as determined by the certification body before reapplying.

Candidates who fail to obtain the pass grade required may retake any of the failed examination sessions (common-core, sectoral theoretical or sectoral practical) once, provided the re-examination takes place within 12 months after the original examination.

Candidates who fail re-examination or do not take re-examination within 12 months may apply for and shall take the examination in accordance with the procedure established for new candidates.

B.4 Assessment for Level 5

The candidates for Level 5 in a given application sector shall have been certified to Level 4 for at least three years in the same sector.

The competence of Level 5 CP persons in accordance with all aspects detailed in 6.8 shall be assessed by the assessment committee on the basis of an interview and a dossier detailing and documenting the following:

— educational, scientific or engineering qualifications of CP persons;

— extent of responsible experience in the particular application sector;

— examples of design documents, reports or technical papers prepared by CP persons;

— demonstration of the a broad range of understanding and competence in of all CP sectors;

— demonstration of continued professional development and that their expertise is at the forefront of the technology and that they are entirely up to date with the practice of CP;

— demonstration that they have made significant contributions to the development of the science and technology of CP.

The dossier shall demonstrate compliance with all of the above without exception.

Candidates for Level 5 shall provide a dossier that is valued by credit points in the following scheme:

a) executed R&D projects: 5 credit points per R&D project;

b) executed engineering projects with sole or premier responsibility for significantly complex or novel CP designs: 5 credit points per project;

c) editor or member of scientific board in technical or scientific journals: 2 credit points per year of job execution;

d) publications in technical or scientific journals or books: 2 credit points per publication;

e) lectures at congresses or training courses: 1 credit point per lecture;

f) participation in standard or technical committees: 1 credit point per committee and year (e.g. 10 credit points if 10 years membership is demonstrated), 2 credit points for convenorship;

g) patents that have been substantially applied: 5 credit points per patent;

h) technical lead in the development of new technology or new applications: 5 credit points per item.

Candidates for Level 5 shall present a track record of 60 credit points at the date of application to be eligible for Level 5.

The dossier shall include technical instructions by a minimum of two independent CP persons with a competence of at least Level 4 familiar with the work of CP persons who shall attest to the veracity and accuracy of the dossier.

B.5 Complaints and appeals

Complaints and appeals shall be addressed in accordance with ISO/IEC 17024.

Annex C
(normative)

Certification scheme: Certificate, validity, re-certification, transition periods

C.1 Certificate

When a CP person is assessed to have fulfilled all certification requirements for the level and application sector defined in this document, the certification body shall issue a document or certificate to that person indicating the satisfactory completion of all the requirements.

The certification body shall maintain sole ownership of the certificates. The certificate shall take the form of a letter and or card or other medium, signed or authorized by a responsible member of the certification body.

The certificate shall be as required in ISO/IEC 17024 and shall contain, as a minimum, the following information:

— name of the certificated person;

— name of the certification body;

— scope of the certification detailing the application sector and level of certification;

— effective date of certification and date of expiry;

— reference to this document as the certification scheme, i.e. ISO 15257;

— a unique identification.

The certificate shall be designed to reduce the risks of counterfeiting.

C.2 Validity

The maximum period of validity of the certification shall be five years. The initial period of validity shall commence when all of the requirements for certification (training, experience, success in competence assessment) are fulfilled.

Certification shall become invalid at the option of the certification body, e.g. after reviewing evidence of unethical behaviour incompatible with the certification procedures.

C.3 Re-certification

C.3.1 General

Re-certification shall be by submission every five years of documentary evidence of continued successful CP work activity without significant interruption (see 3.9) and updating of technical knowledge in the application sector and in addition, every 10 years, an examination or assessment as defined in C.3.2 or C.3.3 shall be required.

C.3.2 Level 1, Level 2 and Level 3

CP persons shall successfully complete a sectoral practical examination session organized to a simplified procedure which assesses ongoing competence to carry out corresponding CP tasks. This shall include tasks appropriate to the scope of competence to be revalidated and, for Level 3, the production of a technical instruction suitable for the use of Level 1 and Level 2 CP persons. If the individual fails to achieve this examination, the person shall be permitted to attempt a complete examination session.

C.3.3 Level 4 and Level 5

Level 4 and Level 5 CP persons shall demonstrate their continued competence to meet the requirements of Clause 6 by the submission of a dossier detailing the continued professional development of CP persons (courses, conferences, etc.), the continued responsible activity of CP persons in undertaking the tasks in Clause 6 in the applicable sector(s) and evidence of continued competence (reports, designs, technical papers, etc.). It shall be required that CP persons provide confirmation of this dossier by the employer and/or independent CP persons.

C.4 Transition periods

C.4.1 Transition period for establishment of a certification body

The following requirements apply to the transition period for a certification body implementing the present certification scheme in one or more application sectors.

The transition period shall not last more than five years after the establishment of the scheme.

In order to establish a certification scheme, or to extend an existing scheme to (a) new application sector(s), the certification body shall appoint trustees for the scheme or the new sector(s).

The certification body shall consider in appointing the trustees the need to ensure that all participants of the CP industry in a country for the application sector(s) proposed for inclusion in the scheme are adequately and ideally equally represented. The trustees should include representatives from, for example:

— operating companies/users with their own CP expertise;

— CP contracting companies;

— CP consulting companies and individuals;

— academics with particular competence in CP.

The certification body shall appoint a minimum of three trustees who shall not be from the same companies and who shall not be commercially or personally linked.

The trustees shall each at least be Level 4 CP persons and shall each have a minimum of 10 years' continuous experience in CP in the sector(s) proposed for inclusion in the scheme. They shall demonstrate by a dossier to the certification body that they have completed CP designs, testing, commissioning and performance verification in the application sector(s) in the previous five years.

The certification body and the trustees shall work together to establish the examination elements of the scheme for the application sector(s) in accordance with this document.

During the transition period, the examiners shall be appointed from the trustees. After the five years of transition period for the establishment of the scheme, examiners who have been formally assessed and certificated to at least Level 4 in the relevant application sector in accordance with Annex B shall be appointed.

During the transition period, the assessment committee shall comprise a minimum of five personnel, each with a minimum of 10 years' experience in CP and shall, in addition, include representatives of the certification body. At least three members of the assessment committee shall be trustees.

C.4.2 Transition period of existing certification schemes and this document

Prior to the publication of this document, certifications that are awarded according to either: EN 15257, NACE International Cathodic Protection Certification Program or AS 2832.1 for the competence levels given in Table C.1, are considered as fulfilling the requirements of this document.

Consequently, certificates delivered according to EN 15257, NACE International Cathodic Protection Certification Program or AS 2832.1 at a maximum two years after publication of this document remain valid also as ISO 15257 equivalents, according to Table C.1 until the next mandatory step in the ISO 15257 certification process, i.e. recertification. At that time, individuals desiring certification according to ISO 15257 shall carry out the requirements of this document.

Table C.1 — Equivalence between existing certification schemes and this document during the transition period

Application sector	Level 1 of this document	Level 2 of this document	Level 3 of this document	Level 4 of this document
Buried on-land structures	NACE Level 1 (CP Tester)	NACE Level 2 (CP Technician) EN 15257 Level 1	NACE Level 3 (CP Technologist) EN 15257 Level 2 AS 2832.1 (Corrosion Technician)	NACE Level 4 (CP Specialist) EN 15257 Level 3 AS 2832.1 (Corrosion Technologist)
Marine and immersed structures	Level 1S CEFRACOR Certification/ Protection cathodique (France)	NACE Level 2 (CP Technician: maritime ships only) EN 15257 Level 1	EN 15257 Level 2	EN 15257 Level 3
Steel-reinforced concrete structures	No present equivalent	EN 15257 Level 1	EN 15257 Level 2	EN 15257 Level 3
Inner surfaces	No present equivalent	EN 15257 Level 1	EN 15257 Level 2	EN 15257 Level 3

Bibliography

[1] ISO 8044, *Corrosion of metals and alloys — Basic terms and definitions*

[2] ISO 12473, *General principles of cathodic protection in sea water*

[3] ISO 12696, *Cathodic protection of steel in concrete*

[4] ISO 13174, *Cathodic protection of harbour installations*

[5] ISO 15589-1, *Petroleum, petrochemical and natural gas industries — Cathodic protection of pipeline systems — Part 1: On-land pipelines*

[6] ISO 15589-2, *Petroleum, petrochemical and natural gas industries — Cathodic protection of pipeline transportation systems — Part 2: Offshore pipelines*

[7] EN 12495, *Cathodic protection for fixed steel offshore structures*

[8] EN 12499, *Internal cathodic protection of metallic structures*

[9] EN 12474, *Cathodic protection for submarine pipelines*

[10] EN 12496, *Galvanic anodes for cathodic protection in seawater and saline mud*

[11] EN 12954, *Cathodic protection of buried or immersed metallic structures — General principles and application for pipelines*

[12] EN 13173, *Cathodic protection for steel offshore floating structures*

[13] EN 13509, *Cathodic protection measurement techniques*

[14] EN 13636, *Cathodic protection of buried metallic tanks and related piping*

[15] EN 14038-1, *Electrochemical realkalization and chloride extraction treatments for reinforced concrete — Part 1: Realkalization*

[16] EN 14505, *Cathodic protection of complex structures*

[17] EN 15112, *External cathodic protection of well casing*

[18] EN 15280, *Evaluation of AC corrosion likelihood of buried pipelines applicable to cathodically protected buried pipelines*

[19] EN 16222, *Cathodic protection of ship hulls*

[20] EN 16299, *Cathodic protection of external surfaces of above ground storage tank bases in contact with soil or foundations*

[21] EN 50162, *Protection against corrosion by stray current from direct current systems*

[22] CEN/TS 14038-2*Electrochemical chloride extraction treatments for reinforced concrete – Part 2: Electrochemical chloride extraction*

[23] AS 2832.1, *Cathodic protection of metals Part 1: Pipes and cables*

[24] ANSI/NACE Standard RP0104, *The Use of Coupons for Cathodic Protection Monitoring Applications*

[25] NACE TM0294, *Testing of Embeddable Impressed Current Anodes for Use in Cathodic Protection of Atmospherically Exposed Steel-Reinforced Concrete*

[26] NACE TM0105, *Evaluation of Organic-Based Conductive Coatings for Use as an Anode on Atmospherically Exposed Reinforced Concrete*

[27] NACE SP0100, *Cathodic Protection to Control External Corrosion of Concrete Pressure Pipelines and Mortar-Coated Steel Pipelines for Water or Waste Water Service*

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[36] NACE SP0207, *Performing Close-Interval Potential Surveys and DC Surface Potential Gradient Surveys on Buried or Submerged Metallic Pipelines*

[37] NACE SP0285, *Corrosion Control of Underground Storage Tank Systems by Cathodic Protection*

[38] NACE SP0286, *Electrical Isolation of Cathodically Protected Pipelines*

[39] NACE SP0290, *Impressed Current Cathodic Protection of Reinforcing Steel in Atmospherically Exposed Concrete Structures*

[40] NACE SP0308, *Inspection Methods for Corrosion Evaluation of Conventionally Reinforced Concrete Structures*

[41] NACE RP0375, *Field-Applied Underground Wax Coating Systems for Underground Pipelines: Application, Performance, and Quality Control*

[42] NACE SP0390, *Maintenance and Rehabilitation Considerations for Corrosion Control of Atmospherically Exposed Existing Steel-Reinforced Concrete Structures*

[43] NACE SP0572-2007, *Design, Installation, Operation, and Maintenance of Impressed Current Deep Anode Beds*

[44] NACE SP0575-2007, *Internal Cathodic Protection (CP) Systems in Oil-Treating Vessels*

[45] NACE TM0101-2012*Measurement Techniques Related to Criteria for Cathodic Protection of Underground Storage Tank Systems*

[46] NACE TM0112-2012, *Test to Determine the Potential Corrosion Effects of Ballast Water Treatment Systems on Ballast Tanks*

[47] NACE TM0190-2012, *Impressed Current Laboratory Testing of Aluminium Alloy Anodes*

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