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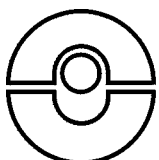
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2nd edition, December 2001

Translation

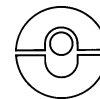
Qualification and certification of personnel responsible for the non-destructive testing of rolling-stock components and assemblies in the course of maintenance operations

*Qualification et certification du personnel chargé des contrôles non destructifs,
sur organes et structures du matériel roulant, en maintenance
Qualifizierung und Zertifizierung des Personals für die zerstörungsfreien
Prüfungen an Fahrzeugbauteilen und Baugruppen bei der Instandhaltung*



*Union Internationale des Chemins de fer
Internationaler Eisenbahnverband
International Union of Railways*

UIC



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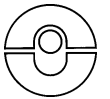
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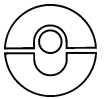
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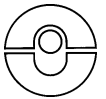


Contents

Summary	1
1 - Purpose and scope	2
2 - References	3
3 - Definitions	4
3.1 - Non-destructive tests (NDT)	4
3.2 - Qualification	4
3.3 - Certification	4
3.4 - Operating authorisation (or enabling procedure)	4
3.5 - Independent certification body	4
3.6 - Authorised certification body	4
3.7 - Examination centre	5
4 - Levels of competency	6
4.1 - Level 1	6
4.2 - Level 2	6
4.3 - Level 3	6
5 - Qualification	7
5.1 - General principles	7
5.1.1 - Test techniques	7
5.1.2 - Application sub-sectors	7
5.2 - Qualification tests	7
5.2.1 - Preliminary conditions	8
5.2.1.1 - <i>Visual acuity</i>	8
5.2.1.2 - <i>Training</i>	8
5.2.1.3 - <i>Experience</i>	8
5.2.2 - Content of tests for Level 1 and 2 officers	9
5.2.2.1 - <i>General question paper</i>	9
5.2.2.2 - <i>Specific question paper</i>	9
5.2.2.3 - <i>Practical tests</i>	9
5.2.3 - Content of tests for Level 3 officers	11
5.2.3.1 - <i>Basic test</i>	11



5.2.3.2 - Test relating to the main test technique chosen	11
5.3 - Conditions governing qualification award	11
5.4 - Qualification validity	12
5.4.1 - Extent of validity	12
5.4.2 - Duration of validity	12
5.4.3 - Invalidation conditions.....	12
5.5 - Extension of qualification	12
6 - Certification	13
6.1 - General principles.....	13
6.2 - Validity of certification	13
7 - Operating authorisation or enabling procedure	14
7.1 - General principle.....	14
7.2 - Granting of operating authorisation	14
7.3 - Validity of operating authorisation.....	14
8 - Recognition of equivalent qualifications	15
Appendix A - Informatory appendix.....	16
Appendix B - Topics for specific question papers	17
Bibliography	18



Summary

This leaflet has been prepared with a view to harmonising the procedures adopted by the various railways and railway undertakings within the European Union in connection with the application, to the railway maintenance sector, of *European Standard EN 473* entitled "Qualification and certification of NDT personnel - General principles".

It defines in particular the different sub-sectors of application (axles, bogies, etc.) as well as the specific qualification procedures for railway maintenance with a view to encouraging the mutual recognition of equivalent qualifications for the staff of the different railway undertakings.

This leaflet has been drawn up under the auspices of the UIC Technical and Research Commission by an ad hoc group comprising representatives of the following railways:

- British Railways/Railtrack: Great Britain,
- Deutsche Bahn AG: Germany,
- Ferrovie dello Stato - Spa: Italy,
- Nederlandse Spoorwegen: Netherlands,
- Société Nationale des Chemins de fer Belges: Belgium,
- Société Nationale des Chemins de fer Français: France.



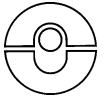
1 - Purpose and scope

This leaflet specifies the procedures for applying *European Standard EN 473* (see - Bibliography - page 18) as regards the qualification and certification of staff responsible for non-destructive testing in the industrial sector of railway rolling-stock maintenance.

It applies essentially to inspecting officers of different grades involved in the execution or technical definition of non-destructive tests on safety-critical components and assemblies.

Application of this leaflet is recommended in the quality assurance systems used in railway maintenance, in accordance with the ISO 9000 standards (see - Bibliography - page 18).

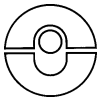
The procedures specified in this leaflet will enable equivalent qualifications for staff to be recognised within the scope defined by the leaflet.



2 - References

Reference is made in the text of this leaflet to the documents listed below (see - Bibliography - page 18):

- EN 473,
- CEN TC 138 TR 211,
- EN 45 013,
- EN 45 010.



3 - Definitions

For the purposes of this leaflet the definitions given in *European Standard EN 473* (see - Bibliography - page 18) have been modified and developed as follows.

3.1 - Non-destructive tests (NDT)

"Non-destructive tests" are procedures applied without alteration to the components and assemblies involved and which, within the railway maintenance sector, are intended to reveal any cracks or other damage inherent in operating. They help to decide whether to keep the component or structure in service, withdraw it, or repair it, in the light of the maintenance rules specified elsewhere.

3.2 - Qualification

The qualification of an officer is a recognition of his/her professional knowledge, skill, experience and physical aptitude, which make him/her suitable to perform the tasks for which he/she is responsible in the field of non-destructive testing correctly.

3.3 - Certification

Certification is the procedure whereby an independent body provides written assurance that the methods used to verify competencies are in compliance with the reference document *European standard EN 473*; it translates into the award of a certificate.

3.4 - Operating authorisation (or enabling procedure)

In addition to the recognition of competencies evidenced by the qualification as per the above definition, a written operating authorisation (or enabling procedure) shall be issued to an officer hierarchically qualified to carry out the designated tasks in the field of non-destructive testing, having regard to his/her special knowledge and suitability for the work, and to the safety regulations to be observed. See *Article 3.10 of standard EN 473*.

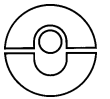
3.5 - Independent certification body

A body which administers procedures for certification of NDT personnel according to *European Standard EN 473*, and which fulfils the requirements of *standard EN 45013* (see - Bibliography - page 18).

In the countries of the EUROPEAN UNION there exist independent bodies which have been accredited by the national authorities; a list of these bodies is provided for information in Appendix A - page 16.

3.6 - Authorised certification body

A body, independent of any single predominant interest, authorised by the independent certification body to prepare and administer examinations to qualify NDT personnel in a given industrial sector.



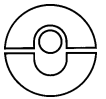
As regards the qualification and certification procedures covered by this leaflet, this body may be set up in the form of a "railway certification committee for maintenance", authorised by an independent national body to administer certification in the railway maintenance sector.

Appendix [A - page 16](#) gives a list of known bodies authorised to administer certification for railway maintenance in the various countries of the EUROPEAN UNION, for information.

3.7 - Examination centre

Centre approved by the independent certification body, either directly or through the authorised body, where the qualification examinations are held.

In the present case, these will be centres with the necessary competencies, equipment and appropriate parts for holding the tests in one or other of the sub-sectors defined in point [5.1.2 - page 7](#).



4 - Levels of competency

In application of *European Standard EN 473* (see - Bibliography - page 18), three levels of competency are recognised for the qualification of officers in the scope defined by this leaflet.

4.1 - Level 1

Officer capable of carrying out non-destructive tests according to written instructions defining the test methodology to be applied, the adjustments to be made, and the classification criteria expressed in the same form as the indication of anomalies in the technique used.

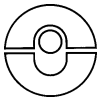
4.2 - Level 2

Officer capable of carrying out and supervising the tasks entrusted to the Level 1 officer, to whom he/she must be able to give assistance in the event of difficulties of interpretation; he/she must also be capable of preparing and drafting written instructions on the basis of guidelines received.

4.3 - Level 3

Officer capable of designating the techniques, defining the application methods and test procedures to be applied in accordance with maintenance rules and actual working conditions; he/she must also be capable of validating the written instructions prepared by a Level 2 officer and overseeing their correct implementation.

The Level 3 officer may be called upon to supervise the qualification examinations in an examination centre.



5 - Qualification

5.1 - General principles

In accordance with *European Standard EN 473* (see - Bibliography - page 18), qualification shall be recognised by means of qualification tests and shall cover the competency of an officer of given level:

- for a given test technique,
- in a given industrial sector or sub-sector.

The industrial sector with which this leaflet is concerned is that of railway maintenance.

5.1.1 - Test techniques

For the purposes of application of this leaflet, the test techniques considered are:

- **ultrasound testing: UT,**
- **magnetic particle testing: MT,**
- **eddy current testing: ET,**
- **dye penetrant testing: PT,**
- **visual testing: VT (in abeyance).**

5.1.2 - Application sub-sectors

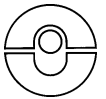
For the purposes of application of this leaflet to the railway maintenance sector, the following specific sub-sectors are considered:

- **wheelsets** (wheels, solid or hollow axles, bearings),
- **bogies and connecting components** (bogie frames, equalising beams, rods, suspension gear, buffing and draw gear).

5.2 - Qualification tests

The qualification tests shall take place in an examination centre approved by the independent certification body, or by the authorised body set up in the form of a railway sector committee. They shall be held under the responsibility of a Level 3 officer designated by one of the above bodies.

The tests shall be carried out in compliance with the provisions of *European Standard EN 473* and in accordance with a written procedure approved by the above-mentioned independent body or authorised body.



5.2.1 - Preliminary conditions

Candidates for qualification must satisfy the following prior conditions:

5.2.1.1 - Visual acuity

The candidate shall provide evidence of satisfactory eyesight meeting the following requirements:

- near-sight vision must be sufficient to read number 1 of the JAEGER scale or number 1,5 of the PARINAUD scale, at a distance of at least 30 cm, or equivalent, for at least one eye, with or without correction,
- colour vision must be sufficient to distinguish and differentiate contrast between the colours used for the test technique in question.

Colour vision may be verified using tests such as the ISHIHARA test.

Visual acuity shall be checked each year.

5.2.1.2 - Training

In addition to initial training in railway technical matters, the duration of which shall be at the discretion of their employers, candidates must have received training in the basic principles of the test technique used and in the methods employed to apply that technique to the railway sub-sector in question.

- For Level 1 and Level 2 officers the minimum length of training required shall be as indicated in the following table for the different test techniques; this includes both theoretical and practical training.

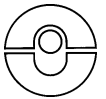
Minimum length of training (in hours)

Test technique	Level 1	Level 2	
		from Level 1	direct access
Ultrasound (UT)	80	80	160
Magnetic particle (MT)	24	24	48
Eddy current (ET)	40	40	80
Dye penetrant (PT)	16	24	40
Visual testing (VT)	in abeyance	in abeyance	

- For Level 3 officers who, generally speaking, are scientifically and technically of "engineer" standard, the duration of additional training in non-destructive testing shall be determined in the light of their initial training and the guidelines given in *standard EN 473* (see - [Bibliography - page 18](#)) (point 6.1.2).

5.2.1.3 - Experience

Candidates for qualification must have had experience in non-destructive testing using the test technique in question and in the relevant railway sub-sector.



The minimum length of experience required shall be as specified in Table 3 (Levels 1 and 2) and Table 4 (Level 3) of *European Standard EN 473* (see - Bibliography - page 18).

5.2.2 - Content of tests for Level 1 and 2 officers

The qualification tests shall comprise three parts:

- a general question paper on the basic principles of the test technique in question;
- a specific question paper on the methods of application of the said technique and the systems used in the relevant railway sub-sector;
- a practical test in the chosen test technique, which should be representative of the procedures and tests actually applied in the relevant railway sub-sector; the specimens used should be actual components or assemblies showing defects and withdrawn from service.

5.2.2.1 - General question paper

The general paper consists of a set of multiple-choice questions, with four possible answers to each question, taken from a set approved by the independent certification body for NDT personnel.

The minimum number of questions per test shall be as indicated in Table 5 of *European Standard EN 473* (point 7.1.1).

The main topics to which the questions shall refer are those indicated in the document quoted in *Annex A to European Standard EN 473*.

The time allowed for answering the general question paper shall be two minutes per question.

5.2.2.2 - Specific question paper

The specific paper also consists of multiple-choice questions, with four possible answers to each question, taken from a set approved by the independent body or the authorised railway certification body.

The minimum number of questions per test shall be as indicated in Table 6 of *European Standard EN 473* (point 7.1.2.).

The main topics to which the questions shall refer are those listed in Appendix B - page 17.

The time allowed for answering the specific question paper shall be three minutes per question.

5.2.2.3 - Practical tests

The candidate shall be required to carry out at least two different tests, using the chosen test technique, on test pieces taken from a collection approved by the authorised railway certification body. The test pieces should be representative of the components or assemblies of the application sub-sector in which the candidate will be working.



Each test piece shall be identified and have a corresponding checklist specifying the discontinuities to be detected. This checklist shall be prepared by a Level 3 officer after testing the test piece using equipment that is identical or similar to that used in the qualification test. If this is not the case, full details concerning the test pieces and operating conditions should be entered on the checklist.

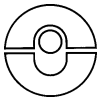
The candidate shall in particular be required to demonstrate his/her ability to:

- set up the test apparatus and systems,
- check and calibrate the said apparatus and systems,
- perform the tests on specified items,
- fill-in the test reports.

For these tests, Level 1 candidates shall have access to written instructions equivalent to those used in a maintenance depot.

In addition, Level 2 candidates must demonstrate their ability to draft written instructions for Level 1 officers in the specific sub-sector in question.

- The recommended durations of the practical tests are as follows:
 - two to three hours for Level 1 officers;
 - two to four hours for Level 2 officers.
- The marking shall be based on the following points which should be taken into consideration by the examiner:
 - a. knowledge of the apparatus, i.e. the functions of the apparatus, setting and checking.
 - b. application of the non-destructive test method to the test piece. This will involve the following operations:
 - preparing the test piece (surface condition, etc.) including a visual examination of the test piece,
 - setting the equipment,
 - performing the test,
 - carrying out post-test operations.
 - c. detection of discontinuities and their characteristics (position, size, dimensions and, for Level 2 officers, an evaluation and preparation of the report),
 - d. for Level 2 officers, drafting of written instructions for Level 1 officers.



The recommended marking for the different parts of the test is given in the following table:

Part	Marks	
	Level 1	Level 2
a	20/100	10/100
b	35/100	20/100
c	45/100	55/100
d	-	15/100

5.2.3 - Content of tests for Level 3 officers

The content of the test for Level 3 officers shall be determined in compliance with the provisions of *European Standard EN 473* (see - [Bibliography - page 18](#)), together with the following points:

5.2.3.1 - Basic test

The general questions for Level 2 officers shall cover the four test techniques dealt with in this document.

5.2.3.2 - Test relating to the main test technique chosen

- The general questions on the main test technique should include the topics listed in the document referred to in *Annex A to EN 473*. These are multiple-choice questions, with four possible answers to each question.
- The specific questions relating to the application of the non-destructive tests in the sub-sector in question must include the topics listed in [Appendix B - page 17](#).

Half of the questions shall be of the multiple-choice type with four possible answers per question, and half shall require written answers.

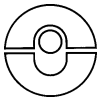
5.3 - Conditions governing qualification award

The qualification shall be awarded to the candidate if he/she obtains an overall mark of 80/100, with no mark below 70/100 in any individual test; marking shall be done in accordance with the rules set out in *Article 7.4 of European Standard EN 473*.

If the qualification is not accompanied by a certificate made out as shown in [point 6 - page 13](#), a certificate of qualification shall be awarded to the candidate. This shall explicitly mention:

- the test technique ([see Point 5.1.1 - page 7](#)),
- the railway application sub-sector ([see Point 5.1.2 - page 7](#)),
- the level of competency ([see Point 4 - page 6](#)),

for which the qualification has been recognised.



5.4 - Qualification validity

5.4.1 - Extent of validity

The qualification awarded to an officer is valid only for his/her particular level of competency, for a given test technique and a given application sub-sector, as specified in point [5.1 - page 7](#).

5.4.2 - Duration of validity

The duration of validity of the qualification shall be 5 years with effect from the date of the tests.

It may be renewed on expiry for successive periods of five years provided the following conditions are all satisfied:

- the officer shall have satisfactorily pursued his/her activities without a break of more than 12 consecutive months in the field for which he/she is qualified,
- the officer shall have successfully passed the visual acuity (eyesight) test the previous year,
- the officer shall have successfully passed practical tests organised according to a simplified procedure at an examination centre.

5.4.3 - Invalidation conditions

The qualification shall be considered void in any of the following cases:

- if there has been a break in the specific activities of the officer for a period of at least 12 consecutive months in the field for which he/she was qualified,
- if the officer's visual acuity (eyesight) no longer meets the standard defined in point [5.2.1.1 - page 8](#),
- in the event of a serious irregularity having justified the withdrawal of the qualification.

5.5 - Extension of qualification

An extension of the officer's activities to cover a test technique other than that in which his/her competency has been recognised shall require extra qualification.

An extension of the operator's activities, using the same test technique, but on another class of components, shall require an addition to the qualification. In this case, the candidate is not required to re-sit the tests relating to the basic test technique.



6 - Certification

6.1 - General principles

If the qualification procedures are validated against *European Standard EN 473* (see - Bibliography - page 18) by an independent certification body meeting the criteria of *European Standard EN 45013* (see - Bibliography - page 18), or by an authorised body operating under the auspices of the former, the qualified officer shall be awarded a "certificate" validated by one of the said bodies.

This certificate shall expressly mention:

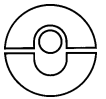
- the identity of the candidate,
- the test technique (see Point 5.1.1 - page 7) ,
- the railway application sub-sector (see Point 5.1.2 - page 7) ,
- the level of competency (see Point 4 - page 6) ,
- the duration of validity of the certification (see Point 6.2 - page 13) .

6.2 - Validity of certification

The extent of validity of the certificate shall be that for which the officer has obtained his/her qualification under the conditions defined in point 5 - page 7.

The duration of validity of the certificate shall be that of the qualification; it may be extended if the requalification conditions set out in point 5.4.2 - page 12 are satisfied.

The certificate shall be rendered void by the loss of the qualification.



7 - Operating authorisation or enabling procedure

7.1 - General principle

The authorisation to perform non-destructive tests on designated components and assemblies, within a given context, shall be granted to an officer by his/her depot manager or by another person delegated from the hierarchy of the department to which he/she is attached.

7.2 - Granting of operating authorisation

The operating authorisation shall be granted to an officer having regard to:

- the competency of the said officer in the field of non-destructive testing, as recognised through the qualification tests,
- the particular conditions of work (inspections at a suitably equipped work station or under a vehicle, in white light or ultra-violet light, with special tools and equipment, etc.),
- the physical fitness of the officer, as required by the particular conditions in which the work is to be carried out,
- the local safety instructions to be observed.

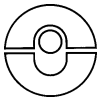
The particular arrangements by which the operating authorisation is granted shall be the responsibility of the railways or railway undertakings concerned.

7.3 - Validity of operating authorisation

The operating authorisation shall be valid only in the field for which the qualification has been recognised and in the operational context for which the authorisation in question has been issued.

The duration of validity of the operating authorisation shall not exceed one year; it may be renewed by the issuing authority provided that the said authority ensures that all the criteria previously mentioned are still being satisfied.

The traceability of the operating authorisation shall be ensured by the department or company to which the officer is attached; it serves as a guarantee of his/her experience in the event of renewal of the qualification or in the event of a change in department or company.



8 - Recognition of equivalent qualifications

The equivalence of competencies in the field of non-destructive testing shall be recognised for officers who operate in the railway maintenance sector:

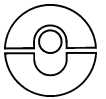
- if the officers possess certificates awarded in compliance with the requirements of this leaflet by an independent body or an authorised certification body in keeping with the definitions given in *European Standard EN 473* (see - Bibliography - page 18),
- if the body which validated the certification procedures is accredited by the national authorities of one of the countries of the EUROPEAN UNION¹.

Equivalent competencies in the railway maintenance sector shall only be recognised:

- for one of the levels of competency defined in point 4 - page 6,
- for one of the test techniques defined in point 5.1.1 - page 7,
- for one of the specific sub-sectors defined in point 5.1.2 - page 7.

The equivalence of the application sub-sectors and specific qualification tests is guaranteed by reciprocal audits of the certification bodies or authorised sector committees operating in the railway maintenance sector, a list of which is provided in Appendix A - page 16.

1. A list of national authorities responsible for accrediting NDT certification bodies is given in Appendix A for information.



Appendix A - Informatory appendix

EU country	Certification bodies for NDT personnel ^a	Accreditation ^b		Authorised railway body or equivalent
		Date	National body	
Germany	DGZ fP (DPZ)	1/3/94	TGA	DGZ fP (DPZ)
Belgium	BANT	(in hand)	BELCERT	
France	COFREND	(in hand)	COFRAC	CFCM Railway Sector Committee
UK	PCN	4/93	NACCB	Railways Sector
Italy	CIC - PND	25/1/94	SINCERT	CIC - PND
Netherlands	S.K.O	25/6/95	Raad Voor de Certificatie	Railway sector integrated into "Steel and equipment construction" sector

a. NDT: Non-destructive testing.

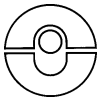
b. Accreditation in accordance with European Standard EN 45010 (see Bibliography).

Certification bodies

- DGZ fP-DPZ - Deutsche Gesellschaft für Zerstörungsfreie Prüfung - Personal Zertifizierungsstelle
- BANT - Belgian Association for Non-destructive Testing
- COFREND - Confédération Française pour les Examens Non Destructifs
- PCN - Personnel Certification of Non-destructive Testing
- CIC-PND - Centro Italiano Coordinamento - Prove Non Destructive
- SKO - Schweizerische Kader-Organisation

Accreditation authorities

- TGA - Trägergemeinschaft für Akkreditierung GmbH
- BELCERT - Belgian Accreditation of Certification bodies
- COFRAC - Comité Français d'Accréditation
- NACCB - National Accreditation Council for Certification Bodies
- SINCERT - Il Sistema Nazionale per l'Accreditamento degli Organismi di Certificazione



Appendix B - Topics for specific question papers

1 - Technology of structures and components

1.1 - Description - Terminology

1.2 - Functioning - Stresses

2 - Purpose of tests during maintenance

2.1 - Anomalies sought

2.2 - Position of tests in maintenance cycles

3 - Special test techniques

3.1 - Equipment - Calibrations - Verifications

3.2 - Particular methods for application of the test technique

4 - Specific procedures

4.1 - Methods of carrying out tests

4.2 - Quality assurance rules (Level 3)

4.3 - Qualification procedures (Level 3)

Comments

1. Topic 1 shall be considered for each of the sub-sectors defined in point [5.1.2 - page 7](#).

Topics 2, 3 and 4 shall be considered for each of the sub-sectors defined in point 5.1.2 and for each of the test techniques defined in point [5.1.1 - page 7](#).

2. For each of the topics, the questions should be adjusted to the levels of competency defined in point [4 - page 6](#).



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