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CERTIFICATION OF PERSONNEL ENGAGED IN DIGITAL RADIOGRAPHIC TESTING (DRT)

ASSOCIATED DOCUMENTS:

PSL/68 - Eligibility in PCN qualification examinations for holders of other Certification

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SPECIFIC REQUIREMENTS FOR THE CERTIFICATION OF PERSONNEL ENGAGED IN DIGITAL RADIOGRAPHIC TESTING

1. SCOPE

1.1 This document prescribes the generic requirements and procedures by which personnel may be examined and, if successful, certified competent for Digital Radiographic Testing (DRT) or Digital Radiographic Interpretation (DRI).

1.2 This certification is generic and does not apply to any specific proprietary equipment. Employers must satisfy themselves that individuals are sufficiently competent at using specific equipment types and versions of software in the appropriate product sector.

1.3 Requirements contained in this document are supplementary to those contained in the current edition of the PCN General Requirements for Certification of Personnel engaged in Non-Destructive Testing. Information on the status of PCN documents is available from www.bindt.org.

2. ELIGIBILITY

2.1 For examination

2.1.1 Candidates will hold current, valid PCN Level 1 or Level 2 Radiographic Testing (RT) certification or Radiographic Interpretation (RI) certification, as appropriate. EN 473 or ISO 9712 RT or RI certification issued by bodies other than BINDT may be accepted on a case by case basis (see PSL/68)

2.2 For certification

2.2.1 Candidates will be required to demonstrate satisfactory completion of a validated DRT or DRI course, as appropriate, at a BINDT Accredited Training Organisation, the duration of which is not less than shown in Table 1.

2.2.2 Candidates will be required to provide verifiable evidence of DRT and/or DRI experience (as appropriate) gained under supervision, the duration of which is not less than shown in Table 1.

Table 1	DRT Level 1	DRI (Interpretation)	DRT Level 2
Minimum training duration (hours) – see Note 1.	12	12	20
Minimum experience duration (months)	1	3	3

3. EXAMINATION CONTENT

3.1 Level 1 DRT Data Acquisition

Except where exemptions apply (refer to PCN General Requirements), all candidates will be required to attempt an examination comprised of the following parts:

3.1.1 Sector specific written examination covering the application of the DRT method in the sector(s) concerned.

3.1.2 Sector Specific Practical examination (see Note 2) comprising:

- (i) the radiographic testing of 2 specimens, selected by the examiner as appropriate to the certification sought (see Note 3), in accordance with NDT instructions provided.
- (ii) evaluation of the suitability for interpretation of the images produced during (i) above.

The total time allowed for the practical part is 4 hours. The minimum pass mark for the practical part is 70% in each sample tested

3.2 Level 2 DRT Data Acquisition and Interpretation

Except where exemptions apply (refer to PCN General Requirements), all candidates will be required to attempt an examination comprised of the following parts:

3.2.1 Sector specific written examination covering the application of the DRT method in the sector(s) concerned, and ten further questions covering product technology related to the sector(s) in which certification is sought.

- 3.2.2 Sector Specific Practical examination (see Note 2) comprising:
- (i) the processing of a phantom (see Note 4) to evaluate the testing system
 - (ii) the examination described at 3.1.2 above (unless a valid PCN Level 1 DRT certificate is held).
 - (iii) the creation of a viewable image (that conforms to the appropriate Standards) in a prescribed manner.
 - (iv) preparation of a detailed NDT Instruction to a provided code, specification or standard for one specimen, and prove this instruction by application.
 - (v) viewing, interpreting and reporting on a total of 5 images representative of the categories of certification sought.

The total time allowed for the practical part is 8 hours. The minimum pass mark for the practical part is 70% in each sample tested and image interpreted

3.3 Digital Radiographic Interpreter (Level 2).

Except where exemptions apply (refer to PCN General Requirements), all candidates will be required to attempt an examination comprised of the following parts:

3.3.1 Twenty multiple choice questions covering the application of the DRT method in the sector(s) concerned, and ten further questions covering product technology related to the sector(s) in which certification is sought. The maximum time allowed is 2 minutes per question. The minimum pass mark is 70%

3.3.2 Sector Specific Practical examination requiring the candidate to read, mark up and report on a total of 5 images representative of the categories of certification sought. Maximum time allowed: 1½ hours. The pass mark is 70% for each radiographic image interpreted.

4. CERTIFICATION AVAILABLE

4.1 Digital Radiographic Testing Level 1

- 4.1.1 Welds
- 4.1.2 Castings
- 4.1.3 Profile/Tangential
- 4.1.4 Other specialised techniques may be added as appropriate

4.2 Digital Radiographic Testing Level 2

- 4.2.1 Welds
- 4.2.2 Castings
- 4.2.3 Profile/Tangential
- 4.2.4 Other specialised techniques may be added as appropriate

4.3 Digital Radiographic Interpretation

- 4.3.1 Welds
- 4.3.2 Castings
- 4.3.3 Profile/Tangential
- 4.3.4 Other specialised techniques may be added as appropriate

5. RENEWAL AND RECERTIFICATION

5.1 The general rules for Level 1 and 2 renewal and recertification are given in PCN document CP16.

5.2 Level 1 Digital Radiographic Testing

Sector Specific Practical examination (Note 3) comprising:

- (i) the radiographic testing of 2 specimens, selected by the examiner as appropriate to the certification sought (Note 2), in accordance with NDT instructions provided.
- (ii) evaluation of the suitability for interpretation of the images produced during (i) above.

The total time allowed for the practical part is 4 hours. The minimum pass mark for the practical part is 70% in each sample tested.

5.3 Level 2 Digital Radiographic Testing

Sector Specific Practical examination (Note 3) comprising:

- (i) processing a phantom (Note 1) to evaluate the testing system
- (ii) the creation of a viewable image (that conforms to the appropriate Standards) in a prescribed manner.
- (iii) preparation of a detailed NDT Instruction to a provided code, specification or standard for one specimen.
- (iv) viewing, interpreting and reporting on a total of 5 images representative of the categories of certification held.

The total time allowed for the practical part is 8 hours. The minimum pass mark for the practical part is 70% in each sample tested and image interpreted.

5.4 Digital Radiographic Interpretation

Sector Specific Practical examination requiring the candidate to read, mark up and report on a total of 5 images representative of the categories of certification sought. Maximum time allowed: 1½ hours. The pass mark is 70% for each radiographic image interpreted.

6. GRADING

The method for grading of initial examinations and supplementary examinations, and the rules for re-examination of failed parts, will be as specified in the current edition of PCN General Requirements. A notional mark of 80% will be used for the General examination part in calculating the composite grade.

7. NOTES

NOTE 1: Up to 50% of the required minimum training hours previously obtained at non-accredited training establishments may be accepted with the provision of supporting documentary evidence in a form acceptable to PCN.

NOTE 2: At the discretion of the examiner oral questions may be used to support the practical examination to ensure the candidate's ability to fully understand the requirements.

NOTE 3: The examiner will select test pieces which will ensure a comprehensive test of the technician's abilities in the selected sector.

NOTE 4: Definition of the term 'Phantom' from BS EN 14784-1: 2005: 'a device containing an arrangement of test targets to evaluate the quality of a CR system as well as monitoring the quality of the chosen system'

TRAINING SYLLABUS FOR DIGITAL RADIOGRAPHIC TESTING

SYLLABUS SPECIFIC TO LEVEL 1 AND LEVEL 2 DIGITAL RADIOGRAPHIC TESTING (DRT).

1.0 Equipment

- a. Minimum quality requirements to be in accordance with appropriate National and International Standards
- b. Phosphor screens to be used with system to comply with requirements of above system
- c. Cassettes
- d. Scanning resolution
- e. Radiation sources
- f. Film tables

2.0 Technique

Castings and Welds (equivalent to standard radiography)

Profile radiography specific application

- a. Dictated by customer parameters
- b. Remaining wall thickness

Must allow for accurate measurement within the area under interest.

3.0 Calibration

Requirement for functional check for data recording and suitability of system over time

4.0 Image processing

Handling of phosphor screen

Lighting levels and effects on screen

Repeatability of viewed image

5.0 Measurement

Specific to each application and defined in the technique

Software specific parameters

Calibration of measuring tool

Effects of magnification

Definition of accuracy

Constraints and capabilities of system accuracy/measurement

6.0 *Interpretation

Modification of image

Use of analysis software

Acceptance criteria

7.0 *Reporting

Defined by user requirements or specification requirements

*Note: The Level 1 syllabus is all the above excluding the interpretation and reporting.

REFERENCE LITERATURE

Essential Reading

- ❑ Appropriate EN Standards as they become available – currently prEN 14784 Series is in draft format “Non-destructive testing – Industrial computed radiography with phosphor imaging plates – Part 1: Classification of systems”
- ❑ EN 444, Non-destructive testing – General principles for radiographic examination of metallic materials using X-rays and gamma-rays
- ❑ EN 584-1. Non-destructive testing – Industrial radiographic film Part 1: Classification of film systems for industrial radiography
- ❑ EN 462-5, Non-destructive testing – Image quality of radiographs Part 5: Image quality indicators (duplex wire type), determination of image quality value
- ❑ E 1647-98a, ASTM Standard Practice for Determining Contrast Sensitivity in Radioscopy
- ❑ ISO 11699-1, Non-destructive testing – Industrial radiographic films Part 1: Classification of film systems for industrial radiography
- ❑ ISO 5579, Non-destructive testing – Radiographic examination of metallic materials by X-and gamma rays – Basic rules
- ❑ ISO/WD 10505, Photography – Root-mean-square (rms) granularity of photographic film: method of measurement

SPECIMEN QUESTIONS FOR DIGITAL RADIOGRAPHIC TESTING EXAMINATIONS

Level 1 Specimen Questions

- 1 Profile Radiography is also known as;
 - a) Computed Radiography
 - b) Tangential Radiography
 - c) Comparative Radiography
 - d) Stereo Radiography
- 2 Geometric unsharpness can be caused by which of the following factors
 - a) Too small a Source to film Distance (SFD)
 - b) Too large a physical source size
 - c) Too large an Object to Film Distance (OFD)
 - d) All of the above
- 3 In Profile Radiography, the Object to Film Distance (OFD) is measured as;
 - a) The pipe diameter
 - b) The distance between the front of the pipe and the film
 - c) The distance from the centreline of the pipe to the film
 - d) The pipe wall thickness
- 4 Comparators are used to provide;
 - a) A contrast comparison
 - b) A measure of the geometric unsharpness present
 - c) A density comparison between the inside and outside of the pipe
 - d) A reference of a known size that is projected on to the image plate
- 5 The image that is stored on the computer, but has not been enhanced or manipulated is known as;
 - a) The Latent image
 - b) The Primary image
 - c) The Unprocessed image
 - d) The Raw image

Level 2 Specimen Questions

- 1 CO₂ corrosion is characterised by.
 - a) A very smooth surface
 - b) Heavy localised pitting
 - c) Heavy general pitting
 - d) Heavy pitting with a Sulphide film
- 2 Bimetallic / Galvanic corrosion is associated with which of the following.
 - a) Vibration and general movement between 2 load bearing surfaces
 - b) Two dissimilar metals in contact/close proximity
 - c) A highly corrosive environment

- d) Two similar metals in a dielectric solution where an electrical current passes between them
- 3 Fretting corrosion is characterised by
- a) Deep heavy pitting
 - b) Material loss caused by the rubbing action of solid particle
 - c) Smooth surface with material loss
 - d) A scab like appearance with heavy corrosive products beneath
- 4 Micro-biological corrosion will normally be found in areas of
- a) High velocity and high particulate content
 - b) Dead legs and stagnant areas
 - c) Under fibreglass insulation
 - d) High temperatures
- 5 When CO₂ mixes with water, an aggressive acid is formed that will gradually eat away at the parent material. This acid is called.
- a) Concentrated Hydrochloric acid
 - b) Sulfuric acid
 - c) Carbonated Hydrochloric acid
 - d) Carbonic acid
- 6 The most common form of corrosion found on unprotected pipe supports and clamps is
- a) Bi-metallic
 - b) Crevice
 - c) Galvanic
 - d) Micro-biological
- 7 Hydrogen Induced Cracking (HIC) and hydrogen blisters are associated with which process environments
- a) Hydrocarbon
 - b) Water processing
 - c) Acid
 - d) Caustic
- 8 Smoothing of the enhanced image is carried out by
- a) Using high pass filters
 - b) Using low pass filters
 - c) Reducing the edge contrast effect
 - d) Blurring of the pixel
- 9 Blow-up of the image is defined as
- a) The increase in the apparent size of an object when its shadow is projected onto a surface
 - b) The percentage distortion or geometric enlargement of an image when projected onto the screen
 - c) When a three dimensional object is projected onto a two dimensional plane, blow-up is the amount of distortion present

- d) None of the above
- 10 What is meant by the term "Burn-off"
- a) That part of the image that is too dark to see
 - b) The apparent thinning of the pipe OD due to overexposure
 - c) The blurring and distortion seen at the edges of the image
 - d) Damage to the screen caused by heat, resulting in an area of blackness in the image.