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Further information concerning the content of PCN documents is available from the PCN Scheme Manager at the above address.

**CERTIFICATION OF PERSONNEL FOR MAGNETIC PARTICLE TESTING IN THE PRE & IN-SERVICE INSPECTION SECTOR**

**ASSOCIATED DOCUMENTS:**

- Appendix Z1 to PCN/GEN (examination syllabus compendium)
- Appendix Z2 to PCN/GEN (specimen examination questions compendium)

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## 1. SCOPE

This document prescribes the specific requirements and procedures by which personnel may be examined and, if successful, certificated for the Magnetic Particle testing of General Engineering Materials and Components. Requirements contained in this document are supplementary to those contained in the current edition of PCN General Requirements for Qualification and Certification of NDT Personnel.

## 2. EXAMINATION CONTENT

The examination format is described in PCN General Requirements. This Appendix amplifies the provisions of that document only where necessary.

### 2.1 Level 1

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

2.1.1 General theory of the Magnetic Particle NDT method

2.1.2 Sector Specific Theory of the application of the Magnetic Particle NDT method to general engineering products including basic production processes and associated defects.

2.1.3 Sector Specific Practical examination comprising:

- (i) preparation of testing systems for use (this may involve system sensitivity and control checks).
- (ii) testing three samples (selected by the examiner) in accordance with NDT instructions provided.
- (iii) reporting test results in a prescribed manner in accordance with the NDT instructions provided.

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

### 2.2 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:

2.2.1 General Theory of the Magnetic Particle NDT method.

2.2.2 Sector Specific Theory of the application of the Magnetic Particle NDT method to the testing of general engineering products, including questions on the basic casting, forging and welding processes and associated defects.

2.2.3 Sector Specific Practical examination comprising:

- (i) preparation of testing systems for use (this may involve system sensitivity and control checks).
- (ii) testing three samples (selected by the examiner from castings, welds and wrought products, according to the certification sought - see Clause 3.2), in accordance with NDT instructions (two to be provided by the test centre and one to be generated by the candidate – see (iv) below) which will give, where appropriate, sensitivity levels and reporting thresholds.
- (iii) reporting test results in a prescribed manner on proforma report sheets.
- (iv) preparation of a detailed NDT instruction (suitable for level 1 personnel to follow) for the testing of one of the above samples to a provided procedure, code, standard or specification, and prove the instruction by application.

The total time allowed for the sector specific practical examination is four hours, the minimum pass mark is 70% in each sample tested.

### 2.3 Level 3

Except where exemptions apply (refer to PCN General Requirements), all candidates will be required to attempt an examination comprising a Basic examination and a Main Method examination.

Information on the content and grading of PCN level 3 examinations is provided in PCN General Requirements for Certification of Personnel engaged in Non-Destructive Testing.

Level 3 candidates who do not hold PCN level 2 certification for magnetic particle testing will be required to successfully complete the examination described in Clause 2.2.3 (excepting clause (iv)).

### **3. CERTIFICATION AVAILABLE**

3.1 **Level 1** Magnetic Particle Testing (portable equipment or/and fixed installations) of general engineering materials, components and fabrications in the pre and in-service inspection multi-sector.

3.2 **Level 2** Magnetic Particle Testing (portable equipment or/and fixed installations) of general engineering materials, components and fabrications in the pre and in-service inspection multi-sector.

Alternatively, Level 1 and Level 2 candidates may apply for single sector for one **(only)** of the following groups:

3.2.1 Castings

3.2.2 Welds

3.2.3 Wrought Products

3.3 **Level 3** Magnetic Particle Testing of general engineering materials, components and fabrications in the pre and in-service inspection multi-sector.

Candidates who achieve an overall score of 80% or more for Level 1, 2 and 3 examinations shall be awarded with the distinction level 'D' (refer to PCN GEN – Grading of Examinations).

### **4. RENEWAL AND RECERTIFICATION**

4.1 The general rules for level 1 and level 2 renewal and recertification are fully described in PCN document CP16, and the rules for level 3 recertification are detailed in PCN document CP17.

4.2 Level 1 and Level 2 certificate holders seeking recertification will be required to undertake the practical examination described above for their level.

### **5. SUPPLEMENTARY EXAMINATIONS**

5.1 Candidates holding certification in one product sector who wish to add another single sector will be required to pass a further practical examination comprising the testing of 3 samples selected by the examiner as representative of the single sector sought.

Candidates should note that this will result in 2 separate certificates being held and will need to be maintained separately.

5.2 Candidates holding certification in one product sector who apply for certification in the multi-sector (all product sectors) will be required to pass a further practical examination comprising the testing of three samples selected by the examiner as representative of the additional sectors sought (see Clause 3.2 above). Level two candidates attempting supplementary examination will not be required to produce a written instruction (Clause 2.2.3 (iv)).

5.3 Candidates who wish to add another category to their existing certification/scope will be required to pass a further practical exam testing samples within the existing sector selected from the new category/scope sought (i.e. portable or fixed).

### **6. GRADING**

General information on the grading of examinations will be as specified in the current edition of PCN General Requirements, and information on the grading of practical examinations is provided in PCN document CP22.

## 7. REFERENCE LITERATURE

### Essential Reading

- ❑ BS EN ISO 9934-2: Non-destructive testing. Magnetic particle testing. Detection media.
- ❑ BS EN 1330-7: Non-destructive testing. Terminology. Terms used in magnetic particle testing.
- ❑ BS EN ISO 17638: Non-destructive testing of welds. Magnetic particle testing.
- ❑ BS EN ISO 23278: Non-destructive examination of welds. Magnetic particle testing of welds. Acceptance levels.
- ❑ BS EN 1330-1: Non-destructive testing. Terminology. List of general terms.
- ❑ BS EN 1330-2: Non-destructive testing. Terminology. Terms common to the non-destructive testing methods.
- ❑ BS EN ISO 3059 Non-destructive testing. Penetrant testing and magnetic particle testing. Viewing conditions.
- ❑ BS EN ISO 9934-1 Non-destructive testing. Magnetic particle testing, General principles.
- ❑ BS EN ISO 9934-2 Non-destructive testing - Magnetic particle testing. Part 2 : Detection media
- ❑ BS EN ISO 9934-3 Non-destructive testing - Magnetic particle testing. Part 3 : Equipment
- ❑ PD 6513: A guide to the principles and practices of applying magnetic particle flaw detection in accordance with BS 6072.
- ❑ ASTM E1444 Standard practice for Magnetic Particle Testing.
- ❑ Product Technology Classroom Training Handbook. Obtainable from the Certification Services Division, The British Institute of Non-Destructive Testing, Midsummer House, Riverside Way, Bedford Road, Northampton, NN1 5NX.
- ❑ Training Course Notes. The PCN Scheme requires candidates to have attended an approved course of training. Approved Training Establishments are required to provide trainees with an up-to-date set of training course notes. These are considered essential reading.

### Recommended Reading

- ❑ Classroom Training Handbook CT-6-3, Magnetic particle testing - General Dynamics, Convair Division.
- ❑ Electrical, Magnetic and Visual Methods of Testing Materials. J Blitz, W.G. King and D.G. Rogers, Butterworth 1969.
- ❑ Non-Destructive Testing Handbook, edited by Robert G McMaster, The Ronald Press, New York.
- ❑ Principles of Magnetic Particle Testing, C E Betz, Magnaflux Corp., Chicago. 1967.
- ❑ Recommended Procedure for Surface Flaw Detection of Steel Castings, by Magnetic Particle Examination. Steel Castings Research and Trade Association 1970.
- ❑ Basic Metallurgy for Non-Destructive Testing, Edited by J L Taylor. The British Institute of Non-Destructive Testing, Midsummer House, Riverside Way, Bedford Road, Northampton, NN1 5NX.
- ❑ ASNT Classroom Training Handbook originally published by General Dynamics.
- ❑ ASNT Self Study Handbook originally published by General Dynamics.
- ❑ ASNT Question and Answer Book.
- ❑ ASNT Level III Study Guide.
- ❑ NDT Handbook, second edition, volume 7 (1991).
- ❑ ASNT Student Package.
- ❑ ASNT Instructor Package (overheads for training).
- ❑ NOTE. Some of the above are available only in reference libraries. For information on sources of the above recommended reading contact The British Institute of Non-Destructive Testing, Midsummer House, Riverside Way, Bedford Road, Northampton, NN1 5NX.