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PCN/GEN APPENDIX B1 ISSUE 6 REV D

CERTIFICATION OF PERSONNEL FOR ULTRASONIC TESTING OF CASTINGS

ASSOCIATED DOCUMENTS:

Appendix Z1 to PCN/GEN (examination syllabus compendium)

Appendix Z2 to PCN/GEN (example examination questions)

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The British Institute of Non-Destructive Testing is an accredited certification body offering personnel and quality management systems assessment and certification against criteria set out in international and European standards through the PCN Certification Scheme.



1. SCOPE

1.1 This document prescribes the specific requirements and procedures by which personnel may be examined and, if successful, certificated for the manual ultrasonic testing of castings. Requirements contained in this document are supplementary to those contained in PCN General Requirements for Certification of Personnel engaged in Non-Destructive Testing.

1.2 Candidates are encouraged to bring their own equipment including probes, but examination centre equipment may be hired subject to availability. Additional time will be allowed in the practical examination for candidates using examination centre provided equipment, the additional time allowed is only to calibrate equipment, producing DAC curves, checking beam spread and main beam angles not for testing samples..

2. EXAMINATION CONTENT

General information on examination content and time allowed for each written part is described in PCN General Requirements for Certification of Personnel engaged in Non-Destructive Testing. 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 Ultrasonic NDT method.

2.1.2 Sector Specific Theory of the application of the Ultrasonic method to castings including basic production processes and associated defects.

2.1.3 Sector Specific Practical examination comprised of:

- (i) preparation and calibration of testing equipment for use (this may involve system sensitivity and control checks).
- (ii) ultrasonic thickness measurement of eight samples of varying thickness and two attenuation measurements to provided NDT instructions.
- (iii) reporting the results in a prescribed manner in accordance with the NDT instructions provided.

The total time allowed for the practical examination is four hours. The minimum pass mark for the practical part is 70% per 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 Ultrasonic NDT method.

2.2.2 Sector Specific Theory of the application of the Ultrasonic NDT method to the testing of castings, including questions on the basic casting process and associated defects.

2.2.3 Sector Specific Practical examination comprising:

- (i) preparation and calibration of testing equipment for use (this may involve system sensitivity and control checks).
- (ii) testing four samples (selected by the examiner) in accordance with NDT instructions (three 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 to prove the instruction by application.

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

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 the ultrasonic testing of castings will be required to successfully complete the examination described in Clause 2.2.3 (excepting clause (iv)).

3. CERTIFICATION AVAILABLE

3.1 Level 1 Ultrasonic Testing (Castings).

3.2 Level 2 Ultrasonic Testing (Castings).

3.3 Level 3 Ultrasonic Testing (Castings).

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. 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.

6. REFERENCE LITERATURE

Essential Reading - Standards and Specifications:

- ❑ BS EN 12668-1 Non-destructive testing – Characterisation and verification of ultrasonic examination equipment – Part 1: Instruments
- ❑ BS EN 12668-2 Non-destructive testing – Characterisation and verification of ultrasonic examination equipment - Probes
- ❑ BS EN 12668-3 Non-destructive testing – Characterisation and verification of ultrasonic examination equipment – Part 3 combined equipment
- ❑ BS EN 583-1 Non-destructive testing – Ultrasonic examination – Part 1: General principles
- ❑ BS EN 583-3 Non-destructive testing – Ultrasonic examination – Part 3: Transmission technique
- ❑ BS EN 583-5 Non-destructive testing – Ultrasonic examination – Part 5: Characterisation and sizing of discontinuities
- ❑ BS EN 1330-4 Glossary of terms used in non-destructive testing. Ultrasonic flaw detection
- ❑ BS EN ISO 2400 Non-destructive testing – Ultrasonic Testing. Specification for calibration block No.1
- ❑ BS EN 12680-1 Founding. Ultrasonic examination. Steel castings for general purposes
- ❑ BS EN ISO 9000 Quality management and quality assurance standards.

NOTE. National or international standards equivalent to the above may be used as alternatives.

Training Course Notes: PCN requires candidates to have attended an approved course of training. Accredited Training Establishments are required to provide trainees with an up-to-date set of training course notes. These are considered essential reading.

Recommended Reading

BS 2737: Terminology of internal defects in castings as revealed by radiography.

BS 3146 Series: Investment castings in metal.

BS 4570: Fusion welding of steel castings. (current/obsolescent)

BS EN 1011-8: Welding. Recommendations for welding of metallic materials. Welding of cast irons. (partially replaces BS 4570)

Basic Metallurgy for NDT. Edited by J L Taylor. British Institute of NDT, Newton Building, St George's Avenue, Northampton, NN2 6JB.

Ultrasonic Flaw Detection for Technicians. J C Drury. British Institute of NDT, Newton Building, St George's Avenue, Northampton, NN2 6JB.

Ultrasonic Testing of Materials. Krautkramer. George Allen & Unwin Limited, London.

Non-Destructive Testing Handbook: Volume 7 - Ultrasonic Testing. ASNT.

Principles and Practice of Non-Destructive Testing, edited by Dr J H Lambell. Heywood and Company, London.

Non-Destructive Testing (second edition, 1991). R Halmshaw. Edward Arnold.

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 3 (1985).

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, Newton Building, St George's Avenue, Northampton, NN2 6JB.