



## Introduction

The PCN Scheme is managed and administered by the British Institute of Non-Destructive Testing (BINDT), which takes into consideration the needs of industry through advice and guidance provided by a Certification Management Committee (CMC) and various technical committees, as required by ISO/IEC 17024. Membership of committees is open to the participation of individuals and organisations, and further information is available from the Certification Services Division of BINDT.

The PCN Scheme provides a BINDT standard and associated programme that is available nationally and internationally, for the certification of Engineering Inspection personnel which satisfies the requirements of ISO17024 and UKAS Guidance documents RG0 and RG2. The scheme is administered directly by BINDT and through a number of Approved Training Organisations (ATO) and Examination Centres (AEC). Holders of certification under this scheme allows the certificate holder to apply for BINDT membership and Engineering Council Registration at the appropriate grade.

Personnel certification for Engineering Inspectors is a scheme driven from within industry for which BINDT was requested to establish, standardize, and administer a training and certification program. To support Engineering Inspection there is also a range of other qualification examinations available within the PCN Scheme covering various Non-Destructive Testing and Condition Monitoring technologies.

Organisations that undertake training and examination of Engineering Inspection personnel in accordance with this document are assessed and approved by BINDT and are referred to as Approved Training Organisations [ATOs] and Approved Examination Centres (AECs). The requirements for ATOs are defined in the BINDT document CP08-ENG (Approval of Engineering Inspector Training Organisations) and ISO 17024 with reference to UKAS RG0 & RG2 where applicable.

This document is supported by associated appendices and other BINDT/PCN documents as referenced herein.

This series of documents is designed to provide comprehensive information for users of the PCN Engineering Inspector Certification Scheme. The complete list of published PCN documents relevant to Engineering Inspector training and certification are detailed in publication reference **PSL/8A-ENG**, which is posted on the BINDT website at [www.bindt.org](http://www.bindt.org), where all documents are available to download free of charge.

Organisations requiring at all times to be in possession of the most up to date PCN documents may register with the "PCN Update Scheme" which, for a small annual fee, guarantees that they automatically receive all new and revised PCN documents.

If further information or advice is required on any certification matter, please contact the Certification Services Division of BINDT on telephone number +44 (0) 1604 893811, or email [cm.admin@bindt.org](mailto:cm.admin@bindt.org).

**Note:** *Accreditation of an inspection body to ISO/IEC 17020 and compliance with the guidelines given in UKAS RG0 should not be confused with personnel certification where a certification body, accredited in accordance with ISO/IEC 17024, issues a certificate of Examination to an individual during which the individual successfully demonstrated his/her ability to undertake certain tasks. The responsibility for authorizing personnel and for ensuring post-examination competence (as detailed in UKAS RG0) remains with the individual's employer. ISO/IEC 17020, UKAS RG0 and this publication provide guidelines relating to 'competence criteria' for the organisation including the individuals who perform technical tasks within that organisation.*

## 1. Scope

- 1.1. This document describes a system for the qualification and PCN certification of personnel who perform engineering inspection in a variety of technologies and industrial applications, in compliance with ISO 17024 and also with reference to UKAS Guidance documents RG0 & RG2.
- 1.2. This scheme is aimed at personnel of higher technical ability who have attained sufficient engineering knowledge to allow entry at the appropriate level. It is not aimed directly at inspectors in specific disciplines.
- 1.3. Specific details of the certification available are contained in the appropriate supplementary appendices to this document.

Three Levels of training and certification are available as follows:

- **Level 1:** In-Service Examination Fixed Equipment – ‘Inspection Engineer’ (Engineering Technician equivalent)
- **Level 2:** In-Service Examination Fixed Equipment – ‘Senior Inspection Engineer’ (Incorporated Engineer equivalent)
- **Level 3:** In-Service Examination Fixed Equipment – ‘Principal Inspection Engineer’ (Chartered Engineer equivalent)
- The successful completion of training and examination under this scheme does not negate the need for, or exempt, the certificate holder from being required to hold the specific certification in individual inspection sectors or technologies as required by any applicable governing standards (i.e. the fields of non-destructive testing and/or condition monitoring).

## 2. References

### 2.1. Normative references

- ISO/IEC 17020, Conformity assessment — Requirements for the operation of various types of bodies performing inspection.
- ISO/IEC 17024, Conformity assessment - General requirements for bodies operating certification of persons.
- ISO/IEC 21-1: Regional or national adoption of International Standards and other international deliverables: part 1: Adoption of International standards.
- UK-SPEC: UK Standard for Professional Engineering Competence Engineering Technician, Incorporated Engineer and Chartered Engineer Standard [www.engc.org.uk](http://www.engc.org.uk)
- RG0: UKAS document - Guidelines on the competence of personnel undertaking engineering inspections
- RG2: UKAS document - Accreditation for In-Service Inspection of Pressure Systems/Equipment
- The Control of Major Accident Hazards Regulations (COMAH)
- EI Guidance on Corrosion Management

*All Standards referenced shall be deemed to be the latest issue/revision unless stated*

### 2.2. PCN documents:

- PSL/4-ENG: Engineering inspector examination availability
- PSL/8A-ENG: Issue status of PCN Engineering Inspector documents
- PSL/30-ENG: Log of experience in Engineering Inspection
- PSL/31: Use of the accreditation mark, the PCN logo and reference to PCN
- PSL/33-ENG: Verification of Identity
- PSL/56A: Verification of Candidate Identification and Signature of Candidate Statement
- PSL/56B: Exam Candidate Acceptance of Examination Rules and Conditions.
- PSL/62-ENG: Invigilation of PCN Engineering Inspector examinations
- PSL/65-ENG: Procedure for administration of training and PCN examination for Engineering Inspection personnel
- PSL/57-ENG: Application for initial/retest examination for Engineering Inspectors
- CP/27: Code of Ethics for PCN certificate holders
- CP16-ENG: Renewal or Recertification (all Categories)
- CP/21: Complaints and Appeals
- CP/12B PCN Criteria for the appointment of Engineers in the PCN engineering inspection scheme under transitional arrangements

### 2.3. BINDT documents:

- CP08- ENG: Approval of Engineering Inspector Training and Examination Organisations

### 3. Terms and Definitions.

For the purposes of this document, the following definitions apply:

- 3.1. **Approved Training Organisation (ATO):** Competent organisation approved by BINDT to provide training of personnel in specific engineering inspection technologies as specified in BINDT CP08- ENG (Approval of Engineering Inspector Training and Examination Organisations). An ATO may also operate, manage and staff remote 'Training Centres' in accordance with CP08- ENG. Remote Training shall be by prior agreement and approval of BINDT.
- 3.2. **Approved Examination Centre (AEC):** A facility approved by BINDT for the conduct of qualification examinations under the control of a BINDT appointed invigilator, in compliance with CP08-ENG and as defined in PSL/63-ENG and PSL/65-ENG.
- 3.3. **Candidate:** A candidate is an individual seeking qualification and certification who works under supervision of suitably qualified personnel whilst gaining relevant experience for qualification.
- 3.4. **Certification:** Procedure used by the certifying body to confirm that the qualification requirements for a method, Category and sector have been fulfilled and that the individual has demonstrated competence and the required skills in performing condition monitoring measurement and analysis, leading to the issue of a certificate. (BS EN ISO/IEC 17024 refers).  
*Note: The issuing of a certificate does not authorise the holder to operate; this authority can only be given by the employer (see clause 5.1.1)*
- 3.5. **Certification Management Committee:** BINDT Committee that is the controlling and decision-making Body for all matters related to the certification program.
- 3.6. **Chartered Engineer:** Qualified person capable of developing solutions to engineering problems using new or existing technologies, through innovation, creativity and change and/or they may have technical accountability for complex systems with significant levels of risk (Engineering Council UK-SPEC definition – see Appendix 2 for further elaboration)
- 3.7. **Competence:** The demonstrated ability to apply knowledge and/or skills.
- 3.8. **Employer:** The organisation for which a candidate or holder of certification works on a regular basis; an employer may also be a candidate at the same time.
- 3.9. **Examiner:** An individual certificated to Level 3 in the method and sector for which he or she is to construct, conduct, supervise and/or grade examinations and who is authorised and assigned to do so by BINDT.
- 3.10. **Incorporated Engineer:** Qualified person capable of maintaining and managing applications of current and developing technology, and who may undertake engineering design, development, manufacture, construction and operation. (Engineering Council UK-SPEC definition – see Appendix 2 for further elaboration)
- 3.11. **Industrial Experience:** Period of time spent in performance of the applicable engineering inspection techniques and analysis, which leads to the acquisition and maintenance of the required skill and knowledge.
- 3.12. **Invigilator:** An individual approved by BINDT to administer and supervise PCN examinations but who does not evaluate competency of the candidate.
- 3.13. **Engineering Inspection Technology:** A technology used for the monitoring of Plant and/or systems and its related degradation in normal operating service as applicable to piping systems and vessels.
- 3.14. **Engineering Technician:** Qualified person capable of applying proven techniques and procedures to the solution of practical engineering problems. (Engineering Council UK-SPEC definition – see Appendix 2 for further elaboration)
- 3.15. **Moderator:** A person qualified to Level 3 in the relevant sector and method and who acts to re-score Level 3 examination papers and to moderate selected Level 1 and 2 papers, as required by BINDT. Also restricted to limitations applied to examiners by BINDT and the approval process.
- 3.16. **Multiple choice examination question:** A question giving rise to a number of potential replies, only one of which is correct, the remainder being incorrect or incomplete. A multiple-choice question may ask candidates to explain their answer. In such cases the model answer shall be available to the examiner on the approved answer matrix. Personnel approved by BINDT to grade multiple choice questions are specified within the BINDT Quality Management System.
- 3.17. **Narrative examination question:** A question requiring a detailed written answer that satisfies the key points identified in a model answer.
- 3.18. **Qualification:** Evidence of training, professional knowledge, skill, and experience to enable personnel to properly perform Engineering inspection, and which forms a prerequisite to attempting examination towards certification.
- 3.19. **Qualification Examination:** An examination administered by BINDT, an AEC in the presence of an approved invigilator that follows the acquisition of the specified qualifications and complies with the conditions specified in PSL/62- ENG and PSL/65-ENG.

- 3.20. **Recertification:** The procedure for revalidation of a certificate through assessment by examination.
- 3.21. **Record of Certification:** A written testimony of qualification listing all PCN certification issued under the rules specified in this document and its antecedents, indicating that the named individual has demonstrated competence in Engineering Inspection under examination conditions and within the scope of the certification.
- 3.22. **Renewal:** The procedure for revalidation of certification without examination.
- 3.23. **Significant Interruption:** An absence from (or a change of) work activity which prevents the holder of PCN certification from practicing the duties corresponding to his/her Level in the Engineering Inspection technology for which certification was issued, for a continuous period in excess of 365 days or a number of periods exceeding two years.  
*NOTE: Legal holidays, or periods of sickness or courses of less than thirty days are not considered when calculating the interruption.*
- 3.24. **Student:** Person attending a course of training
- 3.25. **Training:** The process of instruction in the theory and practice of condition monitoring measurement and analysis at a Category appropriate for the qualification being sought, as specified in CP08-ENG and the this document.  
*Note: Accreditation of an inspection body to ISO/IEC 17020 and compliance with the guidelines given in UKAS RGO should not be confused with personnel certification where a certification body, accredited in accordance with ISO/IEC 17024, issues a certificate of Examination to an individual during which the individual successfully demonstrated his/her ability to undertake certain tasks. The responsibility for authorizing personnel and for ensuring post-examination competence (as detailed in UKAS RGO) remains with the individual's employer. ISO/IEC 17020, UKAS RGO and this publication provide guidelines relating to 'competence criteria' for the organisation including the individuals who perform technical tasks within that organisation.*

#### 4. Abbreviations

The abbreviations used within this document are as follows:

- **AEC:** Approved Examination Centre
- **ATO:** Approved Training organisation
- **BINDT:** British Institute of Non-Destructive Testing
- **CMC:** BINDT Certification Management Committee
- **EI:** Engineering inspection
- **PCN:** Personal Certification scheme administered and controlled by BINDT
- **QMS:** Quality management System

#### 5. General principles

##### 5.1. Duties and responsibilities

##### 5.1.1. The employer is responsible for

- a) confirming the validity of the personal information provided, including the declaration of education, training and experience required for the eligibility of the candidate.
- b) ensuring that they (the employer) are not directly involved in the qualification examination for its own employees.
- c) issuing the operating authorisation, where operating authorisation is a written statement issued by the employer based on the individual's competence as specified by the certificate and other factors, such as job-specific knowledge, skill and physical ability for the specific task.

*Note: Such authorisation can be dependent on the requirement and provision of additional job-specific training by the employer.*

- d) any job-specific training.
- e) verification of continuity in the application of the engineering inspection technology without significant interruption for ENG personnel.
- f) undertaking the required annual surveillance of ENG personnel

5.1.2. Candidates for PCN Certification may be self-employed or unemployed so long as they provide documentary evidence that experience has been gained and maintained under the supervision of suitably qualified personnel.

5.1.3. A self-employed candidate shall assume all of the responsibilities ascribed to the employer.

5.2. **Levels of certification available (See also appendix 3):**

5.2.1. **In-Service Examination Fixed Equipment – Level 3 ‘Principal Inspection Engineer’ (Equates to UKAS RG2 category 1)**

Chartered Engineer as defined by the Engineering Council or equivalent (e.g. appropriate degree with relevant experience, NVQ Level V Engineering) including at least 3 years’ experience within an engineering discipline associated with in-service inspection of pressure systems

5.2.2. **In-Service Examination Fixed Equipment – Level 2 ‘Senior Inspection Engineer’(Equates to UKAS RG2 category 2)**

Incorporated Engineer as defined by Engineering Council or equivalent (e.g. appropriate HNC with relevant experience, NVQ Level IV Engineering) including at least 5 years’ experience within a relevant engineering discipline of which at least one year shall have been spent working within an engineering discipline associated with in-service inspection of pressure systems.

5.2.3. **In-Service Examination Fixed Equipment – Level 1 ‘Inspection Engineer’ (Equates to UKAS RG2 category 3 – 5 inc.)**

Engineering Technician as defined by Engineering Council or equivalent (e.g. appropriate ONC with relevant experience, NVQ Level III) having a minimum of 5 years’ experience within a relevant discipline of which at least one year shall have been spent working within an engineering discipline associated with the in-service inspection of pressure systems.

5.3. **Roles & Responsibilities for each level**

The responsibilities and associated constraints for each level of approval are dependent upon the type of pressure system under inspection as defined by UKAS document RG2. RG2 Table 1 is reproduced in table 1 below for reference.

Table 1: Requirements for Qualifications and Supervision of Inspectors Performing Inspection of Pressure Systems				
Pressure System	PCN/ENG Certification Level	UKAS RG 2 Qualification Category	Supervision	Constraints
Major systems (including steam)	3	1	Occasional	Inspection or associated activities in technology outside the field of competence is prohibited except by formally documented consultation.
	2	2	Occasional	The above constraint plus prohibition on any non-routine repairs, modifications, changes to operating parameters, changes to inspection methods, calculations not defined in recognised standards except with specific approval by an appropriately qualified person. (e.g. Metallurgist, Designer, Process Engineer)
	1	3	Occasional	Permitted only for testing and examination to identify defects, within the limits specified by UKAS RG 2 Category 1 or 2 person (PCN/ENG Level 3 & 2 person). Any decisions involving limits of acceptability, repairs or modifications shall be approved by authorised persons qualified to Category 1 or 2 (PCN/ENG Level 3 & 2 person).
Intermediate systems (excluding steam)	3, 2, 1	1, 2, 3	Occasional	Same constraints as for major systems stated above for respective categories.
Intermediate systems (steam only)	3, 2, 1	1, 2, 3	Occasional	Same constraints as for major systems stated above for respective categories.
Minor systems (excluding steam and pipelines)	3, 2	1, 2	Occasional	Same constraints as for major systems stated above for respective categories.
	1	3	Occasional	Same constraint as for Category 2 person stated above under major systems.
Minor systems (steam only)	3, 2	1, 2	Occasional	Same constraints as for major systems stated above for respective categories.
	1	3	Occasional	Same constraint as for Category 2 person stated above under major systems.

6. **Eligibility for Examination**

6.1. **Education**

6.1.1. Candidates shall be management personnel with suitable experience in the design, manufacture, inspection, operation or maintenance of static pressure systems and their parts, and have the technical knowledge to make professional judgements on the range of safety related problems likely to arise from the scope of inspection and commensurate with the level of certification held (see 5.2 previous).

6.1.2. Such personnel shall be knowledgeable in the:

- a) Problems likely to arise from the declared processes or mechanical conditions.
- b) Mechanical design standards for pressure equipment.
- c) Likely problems associated with various processes and fluids involved.
- d) Effects of operating conditions on the mechanical integrity of systems including interactions with upstream and downstream plant/systems.
- e) Relevant legislative requirements and associated codes of practice.
- f) Inspection techniques associated with static pressure systems/equipment.

NOTE: The level of knowledge shall be commensurate with the level of certification held (see 5.2 previous).

## 6.2. **Training**

6.2.1. The training provided by the BINDT ATO shall provide a working knowledge of the plant, equipment and systems including design construction, operation, maintenance, significance of defects, typical problem areas and associated method of rectification.

6.2.2. The training provided by the BINDT ATO shall address all areas of the published syllabi detailed in Appendix 1 of CP08-ENG, as a minimum. The syllabi shall be applicable to the level of certification sought.

6.2.3. The training shall include the safe conduct of the inspectors' duties, in particular, safe practices applicable to pressure systems such as proper isolation of pressurised connections, certificates to enter confined spaces, permit to work systems, permit to use naked lights and similar safe methods.

6.2.4. To be eligible to apply for examination the candidate shall provide documentary evidence of successful completion of a training course completed at a BINDT ATO in accordance with CP08-ENG.

6.2.4.1. During the implementation period of this document, evidence of receipt of previous training meeting all aspects of the relevant syllabus contained in PCN/ENG/GEN may be accepted at the discretion of BINDT. To be considered as acceptable alternative training, the training shall have been delivered after 01 June 2017 and prior to the implementation of this document. Courses considered for discretionary acceptance would include ASME Plant Inspector training providing the syllabus requirements of PCN/ENG/GEN have been met. Specific API code training is not considered acceptable in meeting the alternative training requirement.

6.2.4.2. Should a training waiver be applied under the conditions described at clause 6.2.4.1, the AQB shall ensure that the candidate has the relevant course knowledge required to attempt the PCN Examination. This may be achieved by discretionary refresher training, delivered by a BINDT ATO, prior to the examination. The required subject knowledge shall be confirmed by the ATO utilising the relevant course assessment(s) required to determine successful completion of training at clause 6.2.4. Any required course assessments shall be administered by a BINDT ATO.

6.2.4.3. Documentary evidence of training and assessment in accordance with clause 6.2.4.2 shall be retained by the ATO and verified by the issue of certification summarising this training. This evidence may include a training certificate and/or records of pre-examination assessments as deemed appropriate.

6.2.5. The training required is based upon cumulative training and experience at each level. The minimum duration of cumulative training for entry at each level is shown in Table 2 below. The formal training course syllabi are given in Appendix 1.

Table 2: Minimum experience & training requirements		
Certification Level	Pre-Requisite (entry level) training & experience	Formal Training Required
PCN/GEN Level 1 (RG 2 cat. 3)	A minimum of 6 months experience spent working within a relevant engineering discipline associated with the in-service inspection of pressure systems	Successful completion of BINDT Approved Training course completed at a BINDT Approved Training Body (ATO). Training must address all aspects of the Level 1 syllabus detailed in Appendix 1 of this document.
PCN/GEN Level 2 (RG 2 cat. 2)	A minimum of 18 months experience spent working within a relevant engineering discipline associated with the in-service inspection of pressure systems  PLUS  A Minimum 1 year as BINDT PCN/ENG Level 1*	Successful completion of BINDT Approved Training course completed at a BINDT Approved Training Body (ATO). Training must address all aspects of the Level 2 syllabus detailed in Appendix 1 of this document.  The applicant must have previously successfully completed the level 1 course detailed above
PCN/GEN Level 3 (RG 2 cat. 1)	A minimum of 36 months experience spent working within a relevant engineering discipline associated with the in-service inspection of pressure systems  PLUS  A Minimum 2 years as BINDT PCN/ENG Level 2**	Successful completion of BINDT Approved Training course completed at a BINDT Approved Training Body (ATO). Training must address all aspects of the Level 3 syllabus detailed in Appendix 1 of this document.  The applicant must have previously successfully completed the level 1 and level 2 courses detailed above

Notes to Table 2

1. \*: Direct Entry to Level 2 may be granted at the discretion by BINDT based upon the applicants full range of experience and time served within the engineering inspection sector. Such exemptions from the core requirements detailed in table 2 above shall be by application to BINDT where each applicant will be reviewed individually. In such instances BINDT decision shall be final.
2. \*\*: Direct Entry to Level 3 may be granted at the discretion by BINDT based upon the applicants full range of experience and time served within the engineering inspection sector. Such exemptions from the core requirements detailed in table 2 above shall be by application to BINDT where each applicant will be reviewed individually. In such instances BINDT decision shall be final.
3. During transitional arrangements following the introduction of this scheme Direct Entry to an appropriate level may be granted at the discretion by BINDT based upon the applicants full range of experience and time served within the engineering inspection sector and taking into consideration any equivalent certifications held at that time. The initial transition period is deemed by BINDT to be 3 years following the implementation of this document. Equivalent certification schemes that may be accepted by BINDT under transitional arrangements include the appropriate API and ASME certification. Such exemptions from the core requirements detailed in table 2 above shall be by application to BINDT where each applicant will be reviewed individually. In such instances BINDT decision shall be final.
4. During transitional arrangements detailed in note 3 above, Candidates applying for direct access to examinations shall be required to successfully complete the ATO's final training assessment/test at the level applied for. Successful completion of these tests at the appropriate level shall exempt the applicant from the mandatory training course at that level. Applicants who fail the applicable ATO assessment shall be denied direct access to examination and must complete the appropriate training course in its entirety. Applicants may complete the full training course at the appropriate level should they wish.

6.2.6. Formal classroom Training time shall meet the minimum requirements given in Table 3 below. The formal training shall include the topics detailed in the appropriate syllabi given in Appendix 1.

Table 3 – Formal Classroom training - Minimum durations (hours)		
Level 1	Level 2	Level 3
30	Level 1 + 30	Level 2 + 30
<i>NOTE The figures shown represent cumulative total months of experience to be held for each classification</i>		

6.2.7. The ATO shall have a documented process in place to demonstrate the checking/verifying of claimed pre-training experience and qualification eligibility.



- 6.2.8. Formal training will take the form of lectures (or an optional equivalent self-study as part of the generic theory topics), demonstrations and practical skills training exercises, as specified in this document and CP08-ENG. The self-study component must be no more than 50% of the course content and be designed, created, issued, and managed by the ATO. Self-study (on-line, internet-learning, data storage device) not created, assigned and managed by the ATO administering the training course will not be accepted as equivalent training time. The trainer must assess the candidates understanding of the material from the self-study portion of the course before the formal component of training resumes and be satisfied that adequate knowledge transfer has occurred. Training course syllabi are shown in Appendix 1 of this document. Training courses must be wholly based on material derived from the ‘essential reading’ references and standards listed in Appendix 4 of this document.
- 6.2.9. To be eligible for PCN Examination the student must “Successfully” complete a BINDT approved training course delivered by a BINDT ATO. The determination of success shall be made by the ATO based upon the options of continual assessment during the course and/or end of course assessment as defined and detailed in CP08-ENG. Upon successful completion of a BINDT approved training course delivered by a BINDT ATO, the ATO shall issue a training certificate confirming successful completion of the course at the stated level. The certificate shall meet the requirements of CP08-ENG.
- 6.2.10. Mature candidates may not need to have completed a BINDT validated course of training , providing they can produce verifiable documentary evidence of training and experience that satisfies the requirements for both Level 1 and Level 2 qualifications. To be eligible to apply for assessment as a mature candidate entry, the candidate shall provide evidence of successful completion of a course of training, that meets the minimum duration and covering the PCN syllabus. If a significant interruption exists, the candidate may be required to undertake further training as determined by BINDT.
- 6.2.11. Eligibility to attempt a qualification examination includes submission of the training certificate/declaration or other evidence to BINDT, together with evidence of experience, payment of the examination fee (invoice term: 30 days net) and submission of PSL/57-ENG to BINDT at least 10 working days prior to the examination.

## 7. Eligibility for Certification

- 7.1. Eligibility to attempt a qualification examination includes submission of the evidence of completion of the pre-examination training requisites detailed in section 6.2 above.
- 7.2. **Industrial Experience**
- 7.2.1. The minimum duration of experience required for specific certification is defined in the specification for each of the 3 levels (see also table 2).
- 7.2.2. For all Levels the minimum experience requirements must be acquired prior to the qualification examination.
- 7.2.3. Documentary evidence of prerequisite experience, identity verification and application for initial examination shall be submitted to BINDT on form PSL/57-ENG. Variation in identity (e.g.: marriage, deed pole etc.) may be submitted on form PSL/33-ENG.
- 7.2.4. The AQB/AEC shall have a process for ensuring that ALL candidates satisfy all requirements, particularly in terms of examination eligibility and identification. The process shall consider, but not be limited to, the checking & verification of the following points:
  - Correctly completed examination application forms (PSL/57-ENG & PSL/30-ENG)
  - Evidence of satisfactory completion of a course of training conducted by a BINDT ENG ATO to the relevant PCN syllabus
  - Pre-certification experience (form PSL/30-ENG must be used for recording experience), including validation by an appropriately qualified person. The AQB/AEC shall have a documented process for recording pre-examination experience verification
  - Identification of the candidate
- Note: Where the ATO is also an AEC then the AEC shall be responsible for implementing and fully documenting a process for checking & recording eligibility status and the meeting of pre-examination requisites.*
- 7.2.5. Candidates for Level 1 and Level 2 shall have their evidence of experience validated by a person at Level 2 or higher or in the absence of such persons, by the candidates technical supervisor or client.
- 7.2.6. Candidates for Level 3 have their evidence of experience validated by a person at Level 3 at least, or in the absence of such persons, by the candidates’ technical supervisor, senior manager or client.
- 7.2.7. The validation process for all categories requires the signature of the validating person, their position and current certificates status and discipline, on the documentary evidence.

## 8. Qualification Examination

8.1. For each certification Level, the candidates shall be required to answer a type and number of examination questions as detailed below. The questions shall be based upon the approved syllabus content.

### 8.1.1. Level 1

- Part A (Written Theory): Minimum 25 question multiple choice question paper
- Part B (Written Theory): 2 descriptive questions to ensure delegate has sufficient knowledge and not just able to memorise answers.
- Part C (Practical): Inspection reporting of 3 nominated components selected at random by the examiner or invigilator.
- time allocated shall be 60 minutes for each part.
- the pass mark set at 70% for each part – candidates must pass all parts.

### 8.1.2. Level 2

- Part A (Written Theory): Minimum 15 multiple choice question paper that requires the candidate to justify their answers (descriptive/narrative) and/or includes calculations. The marking scheme shall detail the marking allocation for each answer. The final result shall be a percentage calculated from all marks attained against the maximum achievable.
- Part B (Written Theory): 1 descriptive question to ensure delegate has sufficient knowledge and not just able to memorise answers.
- Part C (Practical): one case study requiring fitness for service calculation exercise(s),
- time allocated for parts A and B shall be 60 minutes and for Part C, 90 minutes.
- the pass mark set at 70% for each part – candidates must pass all parts.

### 8.1.3. Level 3

- Part A (Written Theory): Minimum 15 multiple choice question paper that requires the candidate to justify their answers (descriptive/narrative) and/or includes calculations. The marking scheme shall detail the marking allocation for each answer. The final result shall be a percentage calculated from all marks attained against the maximum achievable. (1.5 hours permitted)
- Part B (Written Theory): 1 descriptive question to ensure delegate has sufficient knowledge and not just able to memorise answers (1.5 hours permitted)
- Part C (Practical): one case study requiring calculation exercise(s) (1.5 hours permitted)
- Part D (Practical): 1 descriptive/written question testing the candidate's ability to demonstrate management, understanding and control of asset integrity based upon a provided scenario (2.5 hours permitted)
- The pass mark for each part shall be 70% – candidates must pass all parts.

8.2. Initial examination enquiries to BINDT may be by telephone or email. Formal applications must be made on the application form, PSL/57-ENG, submitted by post. No examination appointment can be considered confirmed until correctly completed application form and the required fee have been received by BINDT. Refer to PSL/65-ENG for detailed procedure for examination enquiries.

8.3. The qualification examination must be taken within 5 years of completing the approved training course, however it is highly recommended that the qualification examination be taken within 12 months.

8.4. All examination parts shall be closed book except for approved reference material provided under AQB authorisation (via the invigilator).

8.5. The examination shall be in the English Language.

8.6. A BINDT authorised invigilator will be provided with all necessary examination documentation, including reference material if specified, for submission to candidates at the point of examination.

8.7. Candidates must not be in possession of any non-approved reference documentation during a PCN examination.

## 9. Conduct of Examinations

9.1 BINDT is the appointed AQB for the administration of examinations under this scheme.

9.2 PCN/ENG examinations may be conducted in association with an ATO or Appointed Examination Centre (AEC) but are administered independently by a BINDT approved invigilator in accordance with PSL/62-ENG and PSL/65-ENG.

- 9.3 At the time of examination, the candidate shall have in his possession valid proof of identification, showing a photographic image, which shall be shown to the invigilator upon request. The invigilator will countersign the stamped examination check-sheet validating this proof of identity in accordance with PSL/62-ENG.
- 9.4 Provision is made for candidates with a disability which may affect their ability to complete PCN examinations. For example, up to 25% additional time has been allowed in examinations for candidates suffering from dyslexia or in the event that their first language is not English.
- 9.5 Prior to the commencement of the examination the invigilator shall make all candidates aware of the examination rules and conditions, including the consequences of cheating or collusion. Candidates shall sign a document to confirm their understanding and acceptance of the examination rules and conditions (PSL/56B-ENG).
- 9.6 The presence of mobile phones and any other electronic communication or data storage device is prohibited in examination rooms.
- 9.7 Practical Examinations shall be invigilated by the BINDT appointed invigilator. However technically competent ATO staff should be available to resolve any technical issues that may be encountered by the candidate during the practical examination. This technical input, where required, shall be restricted to issue that do not assist the candidate in the examination attempt and should be given in the presence of, and under the control of, the BINDT invigilator.
- 9.8 Once an examination has commenced, candidates found in possession of equipment, materials or documents, which, if used during a PCN examination, would be deemed to constitute cheating, will be considered to have cheated and the examination will be terminated. No examination results will be issued for those examination parts already completed and a letter will be sent to the candidate concerned and to the employer or sponsor explaining why their examination was terminated. Candidates proved to have cheated in a PCN examination will not be accepted as a candidate for any further PCN examination for a period of 12 calendar months from the date of the examination in which cheating was confirmed to have taken place.
- 9.9 At the end of the qualification examination, completed examination scripts will be handed to the invigilator.
- 9.10 The candidates shall use only black or blue ink pens. The use of pencils and red pens is not permitted.

## **10 Grading of Examinations**

- 10.1 Completed multi-choice examination papers will be marked and graded by an approved examiner by comparison with model answers. Level 2 and 3 examinations containing narrative questions will be marked and graded by a BINDT approved examiner by comparison with model answers and may be moderated by a second appointed examiner in the relevant technology in accordance with PCN procedure. Practical examinations shall be marked by technically competent persons authorised as examiners by BINDT. Practical examinations shall be marked in accordance with approved marking schemes.
- 10.2 To achieve qualification the candidate shall obtain the minimum grade as detailed in clause 8.1 of this document.

## **11 Re-examination**

- 11.1 A candidate who fails the initial examination may attempt only two re-sit examinations of any failed part within a 12-month period. Each re-sit examination must take place not sooner than 30 days after a previous examination. BINDT may use its discretion in allowing an earlier re-sit examination in the event that evidence of further training acceptable to BINDT is undertaken.
- 11.2 If the candidate fails all examination parts then he/she will not be allowed to attempt the same examination for 12 months after the date of the last failed examination.
- 11.3 A candidate whose examination results have not been accepted for reasons of fraud or unethical behaviour shall wait one year before re-applying for examination. The acceptance of any such application shall be at the discretion of BINDT and is not guaranteed.

## **12 Publication of Examination Results**

- 12.1 The examination result notification (pass or fail) will be sent to the candidate at the address given on [PSL/57-ENG](#), with guidance on successful completion of prerequisites if applicable.
- 12.2 Examination results for those who pass the examination will be issued initially by email, and an official result notice and certificate are normally issued within 30 working days of completion of examination provided all examination fees have been paid and all prerequisites are satisfied.

## **13 Certification**

- 13.1 The PCN Certification Records Office will issue certification to candidates who fulfill all prerequisites (training, experience, and success in the relevant examination) for certification.
- 13.2 By issuing the certificate/wallet card, BINDT attests to the qualification of the individual but does not give any authority to work.

**Note:** Accreditation of an inspection body to ISO/IEC 17020 and compliance with the guidelines given in UKAS RGO should not be confused with personnel certification where a certification body, accredited in accordance with ISO/IEC 17024, issues a certificate of Examination to an individual during which the individual successfully demonstrated his/her ability to undertake certain tasks. The responsibility for authorizing personnel and for ensuring post-examination competence (as detailed in UKAS RGO) remains with the individual's employer. ISO/IEC 17020, UKAS RGO and this publication provide guidelines relating to 'competence criteria' for the organisation including the individuals who perform technical tasks within that organisation.

## 14 Validity of Certification

- 14.1 The maximum period of validity of a PCN/ENG certificate/wallet card is five years from the date of initial examination. The certificate will be designated as issue 01.
- 14.2 PCN certification shall be invalid:
- if not signed by the holder.
  - if used outside the scope of certification covered by the certificate.
  - at the discretion of BINDT after reviewing evidence of unethical behaviour.
  - if a *significant interruption* takes place in the application of the competence for which the individual is certificated.
  - from the date of issue of notification of failure in a PCN examination for re-certification.
  - If abused or misused
- 14.3 If a certificate is invalidated due to abuse, misuse, or violation of the code of ethics, then the person shall not re-apply for certification examination for 12 months and only after a PCN convened appeals panel reviews the circumstances. The acceptance of any such application shall be at the discretion of BINDT and is not guaranteed. Should catastrophic failure of a system be caused by such activity the extent of invalidation can be extended under the authority of the BINDT Certification panel in accordance with CP21 and CP27.
- 14.4 PCN certification can be verified at [www.bindt.org](http://www.bindt.org).

## 15 Certification Renewal

- 15.1 At any time within the final 6 months of an initial certificate (issue 01) validity, the holder may renew his/her certificate for a further period of five years upon submission of satisfactory documentary evidence of continuity, without significant interruption, in the application of the certificated competence. To ensure continuity of certification, it is advisable to apply at least 56 days prior to expiry. The renewed certificate will be designated as issue 02.
- 15.2 Applications for renewal after the certificate has expired may be considered for up to one year after expiry, but such applications will be subject to payment of an additional non-refundable administration fee.
- 15.3 If the criteria for renewal are not met, BINDT will immediately cancel the certificate and, to regain the certificate concerned, the individual will need to successfully complete the process for recertification detailed in section 16 below.
- 15.4 Application for renewal for all categories of certification is made on PCN form CP16-ENG.

## 16 Recertification

- 16.1 Five years after any certificate is revalidated through the renewal option (see section 15 above), in order to revalidate the certificate for a further five-year period, the holder will provide satisfactory documentary evidence of continuation training, satisfy the criteria for recertification, and achieve success in an abbreviated written examination covering the sector specific application of the certificated competence. The certificate will be designated as issue 01.
- 16.2 Application criteria for recertification are the same as for renewal, (as detailed in 15.1 and 15.2 above).
- 16.3 For recertification by examination candidates are required to successfully complete the following examination parts detailed in section 8.1 previous and as follows:
- Level 1 – Exam parts B & C only
  - Level 2 – Exam Parts B & C only
  - Level 3 – Exam parts B, C & D
- 16.4 Application for recertification for all categories of certification is made on PCN form **CP16-ENG**.

## 17 Complaints and Appeals

- 17.1 PCN certificate holders must recognise that personal integrity and professional competence are the fundamental principles on which their activities are founded. Accordingly, it is a condition of PCN certification that holders shall comply with a code of ethics (as defined in CP/27). This undertaking is given at the time of submitting an application for examination and/or certification.

- 17.2 An aggrieved party in a dispute, which considers itself to have reasonable grounds for questioning the competency or ethical behavior (see CP/27) of a PCN certificated individual, may petition BINDT for cancellation of certification. Such a petition must be accompanied by all relevant facts and, if it is the view of BINDT that an adequate case has been presented, the certification will be suspended and a full investigation of the circumstances under dispute will be initiated.
- 17.3 If the petition is substantiated to the satisfaction of the PCN Certification Management Committee (CMC), the certification may be cancelled, or renewal and/or re-certification may be refused, for such period as the CMC may decide or, as delineated in clause 14.3.
- 17.4 The candidate or the employer upon application in writing may make appeals against certificate cancellation, failure to certify or failure to renew, to the CMC which may delegate the process of dealing with complaints and appeals to a properly constituted sub-committee, who will refer to the articles of this document and CP27, where applicable.
- 17.5 All complaints and appeals are made on PCN form CP/21.

## 18 Certification and Examination Records

- 18.1 BINDT will retain records relating to qualification and certification of personnel for a minimum period of 11 years. Training & Exam records required to be retained by a BINDT Approved ATO/AEC are detailed in CP08-ENG. The minimum examination records retained shall meet the requirements of ISO 17024.
- 18.2 An updated database of certificated personnel, which includes (amongst other things) the name, PCN identification number and scope of certification held by each individual, is maintained by PCN and can be viewed at [www.bindt.org](http://www.bindt.org).
- 18.3 Audit of specific individual examination records, which are under the jurisdiction of BINDT or its nominees, may be permitted at the discretion of BINDT under certain circumstances, unless in violation of national or EU codes of privacy.

## 19 Use and Misuse of Certificates

- 19.1 The issue of a PCN certificate indicates that the holder has demonstrated an acceptable level of skill and ability measured by means of an examination conducted in accordance with the prevailing requirements for Engineering Inspection. Holders or employers are not permitted to imply any further degree of competence on the basis of the certificate.
- 19.2 PCN certificate holders or their employers must not use or refer to PCN certificates, the PCN logo or the BINDT logo, nor must they knowingly allow them to be used or referred to by a third party, in a manner that may be considered fraudulent or to bring the PCN Scheme into disrepute.
- 19.3 All certificated personnel are required to keep a register of complaints made against them within the scope of the certificate of competence (see CP27). Failure to keep such a register or failure to enter valid complaints in it will be construed as a misuse of the certificate and appropriate penalties will be applied (see clause 14.3). The register of complaints must be made available to BINDT on request.
- 19.4 The penalty for misuse of PCN certification in all cases is invalidation of the certificate (see clause 14.3). If the misuse was in the public domain, publication of the transgression may also be undertaken. Any misuse that appears to be an infringement of the law will result in the matter being reported to the legal authorities in the country concerned.
- 19.5 Certificates are valuable documents, which should be kept in a safe place. Any suspicion of forgery or misrepresentation must be reported to BINDT. Loss or theft of certificates must be reported to the legal authorities in the country concerned and to BINDT.
- 19.6 It is required that all PCN certificate holders maintain records demonstrating continuity in the application of the technology for which they are certificated and used to complete CP16-ENG.
- 19.7 New employers presented with PCN certification should satisfy themselves that the certificate holder has been employed without *significant interruption* on work for which the certificate was granted. It is strongly recommended that the employer request sight of the certificate holder's record of continuity and current status via the BINDT website or direct enquiry to PCN.

## 20 Transitional Arrangements/Transition Period

- 20.1 When this new BINDT/PCN scheme and this document are first introduced, a transitional period of 2 years will be established to allow for experienced engineers to transition to the new scheme and to assist in its full establishment and acceptance. In all cases conferral of transitional approval and arrangements shall be at BINDT discretion. BINDT shall establish a panel of experience engineering and BINDT personnel to review transitional applications. The panel's decision shall be final. CP12B gives full details of the transitional arrangements and application process.
- 20.2 When new PCN examinations are first introduced within the scheme, or are introduced in a country where the examinations have not previously been available, the requirement for persons to have attended a recognised course of training at a BINDT accredited training organisation before attempting a PCN examination may be waived, at the discretion of the PCN Certification Management Committee, until such time as sufficient training provision has achieved PCN recognition or BINDT accreditation.

- 20.3 During transitional arrangements following the introduction of this scheme “Direct Entry” to an appropriate level may be granted at the discretion by BINDT based upon the applicant’s full range of experience and time served within the engineering inspection sector and taking into consideration any equivalent certifications held at that time. The initial transition period is deemed by BINDT to be 3 years following the implementation of this document. Equivalent certification schemes that may be accepted by BINDT under transitional arrangements include the appropriate API and ASME certification. Such exemptions from the core requirements detailed in table 2 above shall be by application to BINDT where each applicant will be reviewed individually. In such instances the BINDT decision shall be final.
- 20.4 During transitional arrangements detailed above, Candidates applying for direct access to examinations shall be required to successfully complete the ATO’s final training assessment/test at the level applied for. Successful completion of these tests at the appropriate level shall exempt the applicant from the mandatory training course at that level. Applicants who fail the applicable ATO assessment shall be denied direct access to examination and must complete the appropriate training course in its entirety. Applicants may complete the full training course at the appropriate level should they wish.
- 20.5 During any transition period, BINDT may appoint duly qualified personnel as examiners for a period not exceeding five years from the effective date of scheme and examination implementation. Any extension of this period can be granted only on the authority of the PCN Certification Management Committee.
- 20.6 Examiners shall possess the:
- The knowledge of the general principles of condition monitoring technologies and specific knowledge relating to the industry sector.
  - experience of the industrial application of Engineering Inspection.
  - ability to create examination questions and model answers, validate questions by cross-reference to the training syllabus and source of knowledge and compile, mark, and grade examination papers.
  - certification to Level 3 if marking and grading narrative or practical examination modules.
  - certification to Level 3 if marking and grading multi choice theory examination papers or be otherwise approved/authorised by BINDT.

## APPENDIX 1 – APPROVED SYLLABI (minimum)

### LEVEL 1 SYLLABUS

#### 1. REGULATIONS

##### 1.1. The Pressure Systems Safety Regulations (PSSR)

- 1.1.1. The Approved Code of Practice (ACOP)
- 1.1.2. Regulation 7 – Safe Operating limits
- 1.1.3. Regulation 8 – Written Scheme of Examination
  - Competent Person
  - Minor Systems
  - Intermediate Systems
  - Major Systems
  - Content of the Written Scheme of Examination
  - Inspection Intervals
  - Review periods
- 1.1.4. Regulation 9 – Examination in accordance with the Written Scheme
  - Personnel
  - Next Examination date
  - Postponement
  - Mobile Systems
  - Format of Reports
- 1.1.5. Regulation 10 – Action in case of Imminent Danger
  - Sequence of events for reporting
- 1.1.6. Regulation 12 – Maintenance
- 1.1.7. Regulation 13 – Modification & Repair
- 1.1.8. Regulation 14 – Keeping of Records

##### 1.2. Offshore Safety Case Regulations

- 1.2.1. Purpose of a Safety Case
- 1.2.2. Regulation 2 – Interpretation
- 1.2.3. Regulation 3 – Communication
- 1.2.4. Regulation 4 – Application
- 1.2.5. Regulation 7 – Corporate Major Accident Prevention Policy
- 1.2.6. Regulation 9 – Establishment of Verification Scheme
- 1.2.7. Regulation 10 – Other provisions as to Verification Schemes
- 1.2.8. Regulation 11 – Defence
- 1.2.9. Regulation 16 – Management & Control of Major Accident Hazards
- 1.2.10. Regulation 25 – Power of competent authority in relation to safety cases and related documents

#### 2. ENGINEERING MATERIALS

##### 2.1. Basic Material considerations

##### 2.2. Cast Irons

##### 2.3. Carbon Steels

- Low Carbon steels
- Medium Carbon steels
- High Carbon steels
- Very High Carbon steels

##### 2.4. Alloy Steels

- Low Alloy
- High alloy
- Martensitic
- Ferritic
- Austenitic

##### 2.5. Material Specifications

##### 2.6. Material Properties

- Strength
- Yield Stress

### LEVEL 2 SYLLABUS

#### 1. ENGINEERING MATERIALS

##### 1.1. Basic Material considerations

##### 1.2. Cast Irons

##### 1.3. Carbon Steels

- Low Carbon steels
- Medium Carbon steels
- High Carbon steels
- Very High Carbon steels

##### 1.4. Alloy Steels

- Low Alloy
- High alloy
- Martensitic
- Ferritic
- Austenitic

##### 1.5. Material Specifications

##### 1.6. Material Properties

- Strength
- Yield Stress
- Stress
- Elasticity
- Plasticity
- Work Hardening (Strain Hardening)
- Ultimate Tensile Stress (UTS)
- Allowable Design Stress
- Ductility
- Toughness
- Charpy Impact Testing
- Hardness

#### 2. PRESSURE EQUIPMENT DESIGN

##### 2.1. Pressure Equipment Systems

- 2.1.1. Pressure Vessels & Relevant Design Standards/Specifications
- 2.1.2. Piping Systems & Relevant Design Standards/Specifications
- 2.1.3. Storage Tanks & Relevant Design Standards/Specifications

##### 2.2. Shell Design of a Pressure Vessel

- 2.2.1. Longitudinal stress arising from internal pressure
- 2.2.2. Circumferential stress arising from internal pressure

##### 2.3. Common Design Codes/Standards/Specifications

- 2.3.1. ASME Boiler & Pressure Vessel Code (BPVC) Section VIII – Rules for Construction of Pressure Vessels Division 1
- 2.3.2. ASME B31.3 ASME Process Piping Code
- 2.3.3. ASME IX -Welding, Brazing, & Fusing Procedures; Welders; Brazers; & Welding, Brazing And Fusing Operators
- 2.3.4. PD5500 Specification for Unfired Fusion Welded Pressure Vessels

##### 2.4. ASME BPVC Section VIII Division 1

- 2.4.1. Summary of the ASME BPVC composition – The varying Sections and Parts explained
- 2.4.2. Part UG – Materials & Design (including specific reference to UG27 for required calculations)
  - Circumferential Stress (Longitudinal Joints) – Formulas & worked calculations
  - Longitudinal Stress (Circumferential Joints) – Formulas & worked calculations
  - Spherical Shells - Formulas & worked calculations
  - ASME VIII UG 32 Formed Heads with pressure on concave side
  - Ellipsoidal Heads - Formulas & worked calculations
  - Torispherical Heads - Formulas & worked calculations

- Stress
- Elasticity
- Plasticity
- Work Hardening (Strain Hardening)
- Ultimate Tensile Stress (UTS)
- Allowable Design Stress
- Ductility
- Toughness
- Charpy Impact Testing
- Hardness

### 2.7. Achieving Desired Properties

- Effects Individual Elements
- Heat Treatment
- Hardening
- Tempering
- Annealing
- Normalising
- Carburisation
- Surface Hardening

## 3. CORROSION AND DAMAGE MECHANISMS

### 3.1. Defining Damage Mechanisms

### 3.2. Damage Mechanism Grouping

- 3.2.1. Uniform (General) Corrosion
- 3.2.2. Localised Corrosion
- 3.2.3. Galvanic Corrosion
- 3.2.4. Environmental Cracking (Stress Corrosion Cracking)
- 3.2.5. Intergranular Corrosion
- 3.2.6. De-alloying (Dezincification, Graphitisation)
- 3.2.7. High Temperature Corrosion
- 3.2.8. Mechanical/Metallurgical Assisted Degradation
- 3.2.9. Microbiologically Induced Corrosion (MIC)
- 3.2.10. Corrosion Under Insulation (CUI)

## 4. PRESSURE EQUIPMENT DESIGN

### 4.1. Pressure Equipment Systems

- 4.1.1. Pressure Vessels & Relevant Design Standards/Specifications
- 4.1.2. Piping Systems & Relevant Design Standards/Specifications
- 4.1.3. Storage Tanks & Relevant Design Standards/Specifications

### 4.2. Shell Design of a Pressure Vessel

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- 4.3.3. ASME IX -Welding, Brazing, & Fusing Procedures; Welders; Brazers; & Welding, Brazing And Fusing Operators
- 4.3.4. PD5500 Specification for Unfired Fusion Welded Pressure Vessels

### 4.4. ASME BPVC Section VIII Division 1

- 4.4.1. Summary of the ASME BPVC composition – The varying Sections and Parts explained
- 4.4.2. Part UG – Materials & Design (including specific reference to UG27 for required calculations)
- 4.4.3. Allowable Stress (S)
- 4.4.4. Joint Efficiency (E)
- 4.4.5. Part UW – Weld Categories
- 4.4.6. Weld Types
- 4.4.7. Extent of NDE (NDT)
- 4.4.8. Worked example(s) for wall thickness calculations related to design criteria

- Hemispherical Heads - Formulas & worked calculations

- 2.4.3. Allowable Stress (S) – including calculations & worked examples
- 2.4.4. Joint Efficiency (E)
- 2.4.5. Part UW – Weld Categories
- 2.4.6. Extent of NDE (NDT)
- 2.4.7. Worked example(s) for wall thickness calculations related to design criteria
- 2.4.8. Discontinuity Stress
- 2.4.9. The Principles of Compensation with reference to ASME VIII UG 37.1 – including calculations & worked examples

## 3. PD5500 DESIGN

### 3.1. Introduction to PD5500

### 3.2. Comparison of PD5500 to ASME VIII

### 3.3. Materials & Construction

### 3.4. Design Strength Values & Index of steels – Reference PD5500 Annex K Table K 1-1

### 3.5. Shells under Internal Pressure (Cylinders & Spheres)

### 3.6. Dished Ends

### 3.7. PD5500 Thickness Definitions

### 3.8. Calculating Head Thickness – Including calculations & worked examples

### 3.9. Special Rules for Central Portions of Torispherical Heads

### 3.10. Hemispherical Heads

## 4. FITNESS FOR SERVICE (FFS)

### 4.1. What is Fitness for Service?

### 4.2. Introduction to API 579 & ASME FFS-1

### 4.3. Other Recognised Codes & Standards

### 4.4. Key Decision-Making Personnel – Roles & Responsibilities

### 4.5. Fitness Assessment Procedure

- 4.5.1. API 579 – Key Steps & Processes
- 4.5.2. Flaw & Damage Mechanisms
- 4.5.3. Applicability & Limitations of Assessment
- 4.5.4. Data Requirements
- 4.5.5. Assessment Techniques & Acceptance Criteria
  - Level 1 Assessment
  - Level 2 Assessment
  - Level 3 Assessment
- 4.5.6. FFS Acceptance Criteria
  - Allowable Stress
  - Remaining Stress factor
  - Failure assessment Diagram – awareness only – not a full specific Level 2 Key Syllabus inclusion

### 4.6. API 579 Part 4 – General Metal Loss (GML) Assessment

- 4.6.1. Wall Loss categories
- 4.6.2. Metal Loss – General Principles
- 4.6.3. Leakage and rupture
- 4.6.4. **API 579 Part 4 – GML Worked Example(s)**
  - Pre-assessment Screening & Data Collection
  - Applicability
  - Data Collection
    - Original Design data
    - Maintenance & Operational History
    - Point Thickness Readings (PTR)
    - Thickness Profile Readings (CTP) – Critical Thickness Profiles process
    - API 579 Standard recording report template
  - Worked Examples/Exercises using PTR
  - Worked Examples/Exercises using CTP



- 4.4.9. Discontinuity Stress
- 4.4.10. The Principles of Compensation

#### 4.5. ASME B31.3

- 4.5.1. Chapter 1 – Scope & Definitions
  - ASME B31 code composition – The varying Sections and Parts explained
  - Scope
  - Intent
  - Content & Coverage
  - Code Exclusions
- 4.5.2. Chapter II Part 2
  - Piping Design & Piping Components
  - The “Y” Factor
  - Membrane Stress
  - Quality Factors
- 4.5.3. Chapter V – Fabrication, Assembly & Erection
  - Pre Heat & Post Weld Heat Treatment (PWHT)
- 4.5.4. Chapter VI – Inspection, Examination & Testing
  - Pressure Testing
  - Hydrostatic Leak Testing
  - Pneumatic Leak Testing
  - Pressure testing procedure(s)
  - The Sensitive Leak Test
  - Worked Example(s) - Pressure Calculations
  - Examination
    - General
    - Responsibility for Examination
    - Examples of Typical Weld Imperfections/Defects

#### 5. WELDING & ASME IX REQUIREMENTS

- 5.1. General Scope & Purpose of ASME IX
- 5.2. Structure & Composition of ASME IX
- 5.3. ASME IX Documentation for Welding
  - 5.3.1. PQR: Procedure Qualification Record
  - 5.3.2. WPS: Welding Procedure Specification
  - 5.3.3. WPQ: Welder performance Qualification Record
- 5.4. Welding Variables
  - 5.4.1. Essential Variable
  - 5.4.2. Non-essential Variable
  - 5.4.3. Supplemental Welding Variables
  - 5.4.4. ASME IX Variable Table(s) – Table QW53
- 5.5. PQR Tests
  - 5.5.1. Bend Tests
  - 5.5.2. Tension Test
  - 5.5.3. Charpy Impact Tests

#### 6. WELDING PROCESSES

- 6.1. General Principles of Arc Welding
- 6.2. SMAW: Shielded Metal Arc Welding
  - 6.2.1. General principles
  - 6.2.2. Electrode Coverings
  - 6.2.3. Advantages of SMAW
  - 6.2.4. Limitations of SMAW
- 6.3. GTAW: Gas Tungsten Arc Welding (also known as TIG – Tungsten Inert gas)
  - 6.3.1. General principles
  - 6.3.2. Advantages of GTAW
  - 6.3.3. Limitations of GTAW
- 6.4. GMAW: Gas Metal Arc Welding
  - 6.4.1. General principles

#### 4.7. API 579 Part 5 – Local Metal Loss (GML) Assessment

- 4.7.1. Relation of Part 5 Assessment to an initial Part 4 Assessment
- 4.7.2. Use of Part 4 Assessment Data
- 4.7.3. Applicability – Characterisation of Local Metal Loss Flaws
- 4.7.4. Required Data Measurements
- 4.7.5. **API 579 Part 5 – Level 1 Assessment Worked Example(s)**
  - Step 1 – Determining S & C Values
  - Step 2 – Determining the wall Thickness to be used in the assessment
  - Step 3 – Determining the minimum measured thickness ( $t_{MIN}$ ) and the Dimension  $S_1$  for the Longitudinal CTP
  - Step 4 – Determining the Remaining Thickness Ratio (Rt) and the Longitudinal Flaw Length Parameter
  - Step 5 – Checking the Limiting Flaw Size Criteria for Level 1
  - Step 6 – Determining if Metal Loss is categorised as a Groove or a Local Thin Area (LTA) and whether to continue to Step 7 or not.
  - Step 7 – Calculating Maximum Allowable Working Pressure (MAWP) using data collected in Step 2
  - Step 8 – Use of API 579 Fig 5.7 if required
  - Step 9 – Spherical Vessel assessment completion
- 4.7.6. Further Options for Inspection of Dished Ends as per API 510
  - Corroded Areas in Vessel heads
  - Step 1 – calculating the area within the central portion
  - Step 2 – Calculating the new required thickness using the Hemispherical Head Formula

#### 5. DAMAGE MECHANISMS

- 5.1. Defining Damage Mechanisms
- 5.2. The Basics of Corrosion
- 5.3. Damage Mechanism Grouping
  - 5.3.1. Uniform (General) Corrosion
  - 5.3.2. Localised Corrosion (Pitting & Crevice Corrosion)
- 5.4. Corrosion Control Techniques
- 5.5. Design
- 5.6. Material Selection
- 5.7. Chemical Treatment
- 5.8. Cathodic & Anodic Protection
- 5.9. Coatings
- 5.10. Corrosion Monitoring Techniques
- 5.11. Corrosion Coupons
- 5.12. Corrosion Probes

#### 6. REPAIRS

- 6.1. Determining Cause of Failure to Aid in Repair Strategy determination
- 6.2. Temporary v Permanent (API Interpretation)
- 6.3. ASME PCC-2 (Post Construction Committee)
  - 6.3.1. Overview & Considerations regarding Repairs
  - 6.3.2. Repairs in accordance with API 510
  - 6.3.3. Lap Band Repairs
  - 6.3.4. Fillet Weld Patches (ASME PCC 2 Article 2.12)
  - 6.3.5. Repair method(s)
  - 6.3.6. Limitations of repair method(s)
  - 6.3.7. Insert Plates
  - 6.3.8. Weld Overlay

#### 7. DNV RP 103 – NON-INTRUSIVE INSPECTION (NII)

- 7.1. NII Overview
- 7.2. DNV RP 103 – Summary
  - 7.2.1. Objectives of Non-Intrusive Inspection
  - 7.2.2. Potential Benefits of Non-Intrusive Inspection
- 7.3. DNV RP 103 – Overview

#### 8. CORROSION RISK ASSESSMENT (CRA)

<p>6.4.2. Advantages of GMAW</p> <p>6.4.3. Limitations of GMAW</p> <p><b>6.5. Base Metals</b></p> <p><b>6.6. Filler Metals</b></p> <p><b>6.7. Weld Consumables</b></p> <p><b>6.8. Electrode Identification</b></p> <p><b>7. IN-SERVICE INSPECTION</b></p> <p><b>7.1. Post Construction Codes &amp; Standards</b></p> <p>7.1.1. Example: API 510 – Pressure Vessel Inspection Code</p> <p><b>7.2. Inspections</b></p> <p>7.2.1. Internal Inspection</p> <p>7.2.2. On-Stream Inspection</p> <p>7.2.3. External Inspection</p> <p>7.2.4. Thickness Examination</p> <p>7.2.5. Corrosion Under Insulation (CUI) Inspection</p> <p>7.2.6. Operator Surveillance</p> <p>7.2.7. Inspection of Ladders, Stairways, Platforms &amp; Walkways</p> <p>7.2.8. Inspection of Foundations &amp; Supports</p> <p>7.2.9. Anchor Bolts</p> <p>7.2.10. Steel Supports</p> <p>7.2.11. Nozzles</p> <p>7.2.12. Grounding Connections</p> <p>7.2.13. Auxiliary Equipment</p> <p>7.2.14. Protective Coatings &amp; Insulation</p> <p>7.2.15. External Surfaces</p> <ul style="list-style-type: none"> <li>• Thickness Averaging for corrosion related wall loss</li> </ul> <p>7.2.16. Isolated Pitting</p> <ul style="list-style-type: none"> <li>• Allowable tolerances</li> </ul> <p>7.2.17. Maximum Allowable Working Pressure (MAWP) Determination</p> <ul style="list-style-type: none"> <li>• Worked Example(s) of MAWP determination</li> </ul> <p>7.2.18. Corrosion Rate Determination</p> <ul style="list-style-type: none"> <li>• Worked Example(s) of Corrosion Rate determination</li> </ul> <p>7.2.19. Joint Efficiency Adjustments</p> <p><b>7.3. API 570 Pipework Inspection</b></p> <p>7.3.1. Types of Inspection</p> <ul style="list-style-type: none"> <li>• Internal Visual Inspection</li> <li>• On-Stream Inspections</li> <li>• Thickness Measurement Inspection</li> <li>• External Visual Inspection</li> </ul> <p>7.3.2. Identifying Areas of Deterioration for Piping Systems</p> <p>7.3.3. Injection Points</p> <p>7.3.4. Injection Point Inspection</p> <p>7.3.5. Deadlegs</p> <p>7.3.6. Freeze Damage</p> <p>7.3.7. Piping Classes</p> <ul style="list-style-type: none"> <li>• Classes 1 to 4 inclusive</li> </ul> <p>7.3.8. Informative knowledge of the process for the Assessment of Inspection Findings based upon API 579</p> <p>(Note: API 579 assessments are not a required element of this Level 1 Syllabus)</p> <p><b>8. VESSEL REPAIRS</b></p> <p><b>8.1. Repairs in accordance with API 510 and reference to ASME PCC-2</b></p> <p>8.1.1. Lap Band Repairs</p> <p>8.1.2. Fillet Weld Patches</p> <p>8.1.3. Repair method(s)</p> <p>8.1.4. Limitations of repair method(s)</p> <p>8.1.5. Insert Plates</p> <p>8.1.6. Weld Overlay</p> <p><b>9. PRESSURE RELIEF VALVES</b></p>	<p><b>8.1. CRA Type 1</b></p> <p><b>8.2. CRA Type 2</b></p> <p><b>8.3. CRA Type 3</b></p> <p><b>8.4. CRA Type 4</b></p> <p><b>9. STRUCTURAL INTEGRITY ASSESSMENT</b></p> <p><b>10. THE NON-INTRUSIVE INSPECTION (NII) RECORD – DNV RP 103</b></p> <p><b>10.1. Worked examples of NII Decision Records</b></p> <p><b>10.2. Application of the Screening Process (DNV RP 103 Figure 3-1)</b></p> <p><b>10.3. Inspection Type Definitions (DNV RP 103 Table 4-1)</b></p> <p>10.3.1. Type A overview &amp; Examples</p> <p>10.3.2. Type B overview &amp; Examples</p> <p>10.3.3. Type C overview &amp; Examples</p> <p><b>10.4. Inspection Grades (DNV RP 103)</b></p> <p>10.4.1. Grade 0 Items</p> <p>10.4.2. Grade 1</p> <p>10.4.3. Grade 2</p> <p>10.4.4. Grade 3</p>
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## 9.1. General Principles & Usages

## 9.2. Definitions of types of Pressure Relief Valve

## 9.3. PSV Classifications

- 9.3.1. Direct Acting PSV
- 9.3.2. Pilot Operated PSV

## 9.4. Direct Acting Type

- 9.4.1. Spring Loaded Design
- 9.4.2. Re-Seating
- 9.4.3. Back Pressure
- 9.4.4. Conventional Valves
- 9.4.5. Balanced Bellow Valve

## 9.5. Pilot Operated Type

- 9.5.1. General Principles
- 9.5.2. Rupture Discs

## 10. INSPECTION AND EXAMINATION

### 10.1. NDE: Non-Destructive Examination (also known as NDT: Non-Destructive testing)

### 10.2. ASME V and API 577 – requirements & methods for NDE/NDT

#### 10.2.1. Visual Examination/testing (VT)

#### 10.2.2. Radiographic Inspection (RT)

- Image quality Indicators (IQI)
  - Wire Type
  - Hole Type
- Methods of Radiography
  - X-Ray
  - Gamma Ray
- Radiographic Techniques
- Radiographic Density
- Geometric Unsharpness
- Excessive Backscatter – effects & controls

#### 10.2.3. Ultrasonic Examination (UT)

- Types of Ultrasonic Display
  - A-Scan
  - B-Scan
  - C-Scan
- Straight Beam Techniques (0° Compression wave Inspection)
- Angle Beam Techniques (Shear Wave Inspection)

#### 10.2.4. Liquid Penetrant Inspection (PT)

- General Principles
- Techniques
  - Colour Contrast methods
  - Fluorescent methods

## LEVEL 3 SYLLABUS

### 1. MODULE 1 REGULATIONS

#### 1.1. Refresher on the following regulations:

- 1.1.1. Pressure System Safety Regulations (PSSRs)
- 1.1.2. Control of Major Accidents Hazards (COMAH)
- 1.1.3. Offshore Safety Case Regulations
  - Design and Construction Regulations. (DCR)
  - Prevention of Fire, Explosions and emergency Response (PFEER)

#### 1.2. Roles and Responsibilities of the Competent Person

#### 1.3. Roles and responsibilities of the Technical Authority

#### 1.4. Case Study of previous incident and prosecution

- What went wrong?
- Why did it go wrong?
- Who was responsible?
- The repercussions.

#### 1.5. Practical scenario. Identify the breaches in Regulations, the potential consequences and where the responsibility lies.

### 2. MODULE 2 PRESSURE EQUIPMENT DESIGN

#### 2.1. Pressure vessels – PD 5500 & ASME VIII

##### 2.1.1. Nozzle Re-enforcement calculation

#### 2.2. Pressure piping – ASME B31.3

##### 2.2.1. Bend $T_{min}$ calculations

##### 2.2.2. Bending Stress calculations for unsupported pipework

##### 2.2.3. Piping reinforcement calculations

### 3. MODULE 3 MATERIALS AND DAMAGE MECHANISMS

#### 3.1. Introduction to Fracture Toughness

#### 3.2. Stress Intensity Factors

#### 3.3. In-depth coverage of CL SCC and Pitting.

#### 3.4. Impact test requirements to minimise Brittle fracture

### 4. MODULE 4 INSPECTION PRACTICES AND INTEGRITY MANAGEMENT

#### 4.1. Inspection objectives

##### 4.1.1. Lifecycle asset integrity management- Introduction to 'Plan – Do – Check – Act'

##### 4.1.2. API 581 RBI methodologies – Inspection Effectiveness gradings

##### 4.1.3. CUI planning and an overview of API 583/Energy Institute and European Federation of Corrosion Publications

#### 4.2. Inspection reporting

##### 4.2.1. Writing an inspection plan for a system, inclusive of vessels and piping within at the system.

#### 4.3. Equipment integrity assessment

##### 4.3.1. FFS for wall less on bends

##### 4.3.2. Level 1 crack assessment using FAD under part of 579

### 5. MODULE 5 WELDING

#### 5.1. Required WRPS and PQR documentation

#### 5.2. How to ensure the correct qualification of a WPS from a PQR

### 6. MODULE 6 EQUIPMENT FAILURE INVESTIGATION

#### 6.1. How to conduct a failure investigation, including Root Cause methods

#### 6.2. Overview of Cause and Affect'

**Competence**

Competence is the ability to carry out a task to an effective standard. To achieve competence requires the right level of knowledge, understanding and skill, and a professional attitude. Competence is developed by a combination of formal and informal learning, and training and experience, generally known as initial professional development. However, these elements are not necessarily separate or sequential and they may not always be formally structured. Pages 10 – 31 of this UK-SPEC set out the threshold generic competence and commitment standards for registration as an Engineering Technician, Incorporated Engineer or Chartered Engineer, and include some examples of the kind of evidence that would help to demonstrate these. The list of examples is not intended to be exhaustive. There may be other examples and local equivalents.

There are five generic areas of competence and commitment for all registrants, broadly covering:

- A. Knowledge and understanding
- B. Design and development of processes, systems, services and products
- C. Responsibility, management or leadership
- D. Communication and inter-personal skills
- E. Professional commitment

For each category of registration, the formal education qualification to demonstrate the necessary knowledge and understanding that underpins competence is also given. Applicants without exemplifying qualifications may demonstrate the required knowledge and understanding in other ways, and increasingly, workplace learning is contributing to this.

**Competence Table as per ISO 17020**

**Competences table**

Attribute	Requirement	Training	Assessment
Personal	Ability to understand and comply with verbal, written or demonstrated instructions. Ability to behave in a responsible manner in a safety-critical environment.	General plant work, incl. Unloading/unpacking and pre-inspection sorting and preparation, manual handling	Observation and questioning to determine job understanding and ability to work without continuous supervision.
Basic industry knowledge	Basic understanding of product characteristics, Health & Safety at Work requirements, familiarity with product types.	Plant induction training Plant activity training	Written or oral assessment of each module of training, together with supervisor observation of initial work period.
Basic product inspection knowledge	Outline knowledge of legal requirements to inspect & dangers of faulty inspection. Returned / faulty product segregation requirements	Training in IB procedures and requirements for inspection of various product types. Initial service return segregation training.	Written or oral assessment of initial inspection training. Practical assessment
Detailed product inspection knowledge	Knowledge of inspection requirements for product types. Knowledge of inspection methods to be applied. Knowledge of acceptance/rejection criteria. Actions for rejected products. Understanding of limitations of activity and sources of assistance.	Specific product inspection training, covering inspection methods to be applied to various product types, acceptance/rejection criteria. product reconditioning & scrapping criteria.	Written or oral assessment of each inspection method. Supervisor assessment of initial work under supervision, followed by signing off by candidate and supervisor. Periodic audits. Live witness of inspection at least once every 2 years.

## **1. Engineering Technicians (PCN ENG-GEN Level 1 equivalent)**

Engineering Technicians apply proven techniques and procedures to the solution of practical engineering problems.

Engineering Technicians are required to apply safe systems of work and are able to demonstrate:

- Evidence of their contribution to either the design, development, manufacture, commissioning, decommissioning, operation or maintenance of products, equipment, processes or services
- Supervisory or technical responsibility
- Effective interpersonal skills in communicating technical matters
- Commitment to professional engineering values.

### **Engineering Technicians (PCN ENG-GEN Level 1 equivalent) - Education**

Knowledge and understanding are important components of professional competence. The following qualifications exemplify the required knowledge and understanding for Engineering Technicians:

- An Advanced/Modern Apprenticeship or other work-based learning programme approved by a licensed professional engineering institution
- or a qualification, approved by a licensed professional engineering institution, in engineering or construction set at level 3 (or above) in the Qualifications and Credit Framework/National Qualifications Framework<sup>†</sup> for England and Northern Ireland; or at level 6 (or above) in the Scottish Credit and Qualifications Framework; or at level 3 (or above) in the Credit and Qualifications Framework for Wales
- or equivalent qualifications approved by a licensed professional engineering institution.

Many qualifications may be acceptable as evidence that part or all of the necessary competence has been acquired. Please check the Engineering Council's searchable database of approved qualifications and programmes for information about current approved status: [www.engc.org.uk/techdb](http://www.engc.org.uk/techdb)

Many potential Engineering Technicians have not had the advantage of formal training, but are able to demonstrate that they have acquired the necessary competence through substantial working experience. Thus individuals without the types of qualifications described above may apply for an Individual Route assessment. This process, administered by the applicant's institution, includes assessment of prior learning and of current performance. Evidence of employer recognition of competences and relevant skills may be helpful.

Applicants should consult their institution for advice on the most appropriate option.

## **2. Incorporated Engineer (PCN ENG-GEN Level 2 equivalent)**

Incorporated Engineers maintain and manage applications of current and developing technology, and may undertake engineering design, development, manufacture, construction and operation.

Incorporated Engineers are able to demonstrate:

- The theoretical knowledge to solve problems in developed technologies using well proven analytical techniques
- Successful application of their knowledge to deliver engineering projects or services using established technologies and methods
- Responsibility for project and financial planning and management together with some responsibility for leading and developing other professional staff
- Effective interpersonal skills in communicating technical matters

### **Incorporated Engineer (PCN ENG-GEN Level 2 equivalent) - Education**

Knowledge and understanding are important components of professional competence. Formal education is the usual, though not the only, way of demonstrating the necessary knowledge and understanding, and the following qualifications exemplify the required knowledge and understanding for Incorporated Engineers:

- An accredited Bachelors or honours degree in engineering or technology
- or a Higher National Diploma or a Foundation Degree in engineering or technology, plus appropriate further learning to degree level\*
- or an NVQ4 or SVQ4 which has been approved for the purpose by a licensed professional engineering institution, plus appropriate further learning to degree level\*.

\*See [www.qaa.ac.uk](http://www.qaa.ac.uk) for qualification levels and HE reference points.

The Engineering Council website provides searchable databases of accredited programmes. Please check the Engineering Council website: [www.engc.org.uk/courses](http://www.engc.org.uk/courses)

Applicants who do not have exemplifying qualifications may demonstrate the required knowledge and understanding in other ways but must clearly demonstrate they have achieved the same level of knowledge and understanding as those with exemplifying qualifications.

Ways to demonstrate this include:

- Taking further qualifications, in whole or in part, as specified by the institution to which they are applying
- Completing appropriate work-based or experiential learning
- Writing a technical report, based on their experience, and demonstrating their knowledge and understanding of engineering principles
- Until 2011, taking Engineering Council examinations.

Applicants should consult their institution for advice on the most appropriate option.

### **3. Chartered Engineer (PCN ENG-GEN Level 3 equivalent)**

Chartered Engineers develop solutions to engineering problems using new or existing technologies, through innovation, creativity and change and/or they may have technical accountability for complex systems with significant levels of risk.

Chartered Engineers are able to demonstrate:

- The theoretical knowledge to solve problems in new technologies and develop new analytical techniques
- Successful application of the knowledge to deliver innovative products and services and/or take technical responsibility for complex engineering systems
- Accountability for project, finance and personnel management and managing trade-offs between technical and socio-economic factors
- Skill sets necessary to develop other technical staff
- Effective interpersonal skills in communicating technical matters.

#### **Chartered Engineer (PCN ENG-GEN Level 3 equivalent) - education**

Knowledge and understanding are important components of professional competence. Formal education is the usual, though not the only, way of demonstrating the necessary knowledge and understanding, and the following qualifications exemplify the required knowledge and understanding for Chartered Engineers:

- An accredited Bachelor's degree with honours in engineering or technology, plus either an appropriate Master's degree or Engineering Doctorate (EngD) accredited by a professional engineering institution, or appropriate further learning to Masters level\*;
- or an accredited integrated MEng degree.

\*See [www.qaa.ac.uk](http://www.qaa.ac.uk) for qualification levels and HE reference points.

The Engineering Council website provides a searchable database of accredited programmes. Please check the Engineering Council website: [www.engc.org.uk/courses](http://www.engc.org.uk/courses)

Applicants who do not have exemplifying qualifications may demonstrate the required knowledge and understanding in other ways, but must clearly demonstrate they have achieved the same level of knowledge and understanding as those with exemplifying qualifications.

Ways to demonstrate this include:

- Taking further qualifications, in whole or in part, as specified by the institution to which they are applying
- Completing appropriate work-based or experiential learning
- Writing a technical report, based on their experience, and demonstrating their knowledge and understanding of engineering principles
- Until 2011, taking Engineering Council examinations.

Applicants should consult their institution for advice on the most appropriate option.

**For Guidance on actual Engineering Council Registration see Document UK-SPEC (UK Standard for Professional Engineering Competence) available at [www.engc.org.uk/ukspec](http://www.engc.org.uk/ukspec)**

## APPENDIX 3

### UKAS RG 2 Qualification categories (with PCN/GEN targeted Equivalence)

**Category 1. (PCN/ENG Level 3 equivalent):** Chartered Engineer as defined by the Engineering Council or equivalent (e.g. appropriate degree with relevant experience, NVQ Level V Engineering) including at least 3 years' experience within an engineering discipline associated with in-service inspection of pressure systems.

**Category 2. (PCN/ENG Level 2 equivalent):** Incorporated Engineer as defined by Engineering Council or equivalent (e.g. appropriate HNC with relevant experience, NVQ Level IV Engineering) including at least 5 years' experience within a relevant engineering discipline of which at least one year\*\* shall have been spent working within an engineering discipline associated with in-service inspection of pressure systems.

**Category 3. (PCN/ENG Level 1 equivalent):** Engineering Technician as defined by Engineering Council or equivalent (e.g. appropriate ONC with relevant experience, NVQ Level III) having a minimum of 5 years' experience within a relevant discipline of which at least one year shall have been spent working within an engineering discipline associated with the in-service inspection of pressure systems or,

**Category 4. (Included in PCN/ENG Level 1):** Person trained\* in a relevant engineering discipline with a recognised and documented engineering apprenticeship with a minimum of 5 years' experience within a relevant discipline of which at least one year shall have been spent working within an engineering discipline associated with the in-service inspection of pressure systems.

**Category 5. (Included in PCN/ENG Level 1):** Person with less than tradesman's apprenticeship but with a minimum of 5 years\*\*\* spent working with or within the industry associated with pressure systems and has general knowledge of pressure systems and its operating environment. Personnel shall be placed on recognised training courses with appropriate documented tests in in-service inspection of pressure systems. The minimum age for this Category is 21 years.

\* Persons in Categories 4 and 5 shall pass a qualifying test, established by the Inspection Body, associated with the particular inspection activities relating to pressure systems/equipment and this should cover relevant knowledge of the law, codes of practice and inspection techniques.

\*\* Where a person meets the minimum requirement for a specific discipline and is to be trained in a second discipline, it may not be necessary to have experience of at least one year in the second discipline provided that the required competence can be demonstrated.

\*\*\*For some routine, well-monitored activities this period may not be necessary.

## APPENDIX 4

### REFERENCE DOCUMENTS & ESSENTIAL READING MATERIAL

This list is not exhaustive, but the main legislation, standards, specifications and trade association codes pertinent to this document are listed below.

#### 1. UK Legislation and Associated Codes of Practice and Guidance

- Statutory Instrument 2000 No 128 Pressure Systems Safety Regulations 2000
- The Control of Major Accident Hazards Regulations (COMAH) 2015
- Safety of Pressure Systems, Pressure Systems Safety Regulations 2000, Approved Code of Practice - L122
- Energy institute Guidance for Corrosion Management in Oil & Gas production & processing - 2nd Edition - March 2018
- Written Schemes of Examination, Pressure Systems Safety Regulations 2000 INDG 178
- Pressure Systems - Safety and You - INDG 261
- Automatically controlled steam and hot water boilers - PM5
- Steam boiler blowdown systems - PM 60
- Safe management of ammonia refrigeration systems - PM81
- Safety at autoclaves - PM73
- Safety in Pressure Testing GS4 (Third Edition)
- Health & Safety at Work Act 1974
- A guide to the Health and Safety at Work etc. Act 1974 - L1
- The Offshore Installations (Safety Case) Regulations 2015, No. 398
- A guide to the Pipelines Safety Regulations 1996. Guidance on Regulations L82
- Safe use of work equipment. PUWER 98. Approved Code of Practice and Guidance - L22
- Approved Code of Practice, Safe work in confined spaces. Confined Spaces Regulations 1997. Regulations and Guidance - L101
- Compressed Air Safety - HSG 39

#### 2 Statutory Instruments (SI)

- DCR SI 913 (1996) - Design and Construction Regulations
- PSR SI 825 (1996) - Pipeline Safety Regulations
- PFEER SI 743 (1995) - Prevention of Fire, Explosion and Emergency Response Regulations
- MAR SI 738 (1995) - Management and Administration Regulations
- PUWER SI 2932 (1998) - Provision and Use of Work Equipment Regulations (Plant and Equipment)

#### 3 Relevant EU Directives and Associated UK Legislation

- 97/23/EC Pressure Equipment Directive
- Statutory Instrument 1999 No 2001 Pressure Equipment Regulations 1999
- 87/404/EEC Simple Pressure Vessel Directive
- Statutory Instrument 1991 No 2749 Simple Pressure Vessels (Safety) Regulations 1991

#### 4 Standards and Related Documents

- BS EN ISO/IEC 17020, General Criteria for the Operation of Various Types of Bodies Performing Inspection
- IAF/ILAC-A4:2004, Guidance on the Application of ISO/IEC 17020
- Accreditation for In-service Inspection of Pressure Systems/Equipment RG 2 | EDITION 4 | January 2010
- BS EN ISO/IEC 17024, General requirements for bodies operating certification of persons

#### 5 Industry Guidance/Publications

- Safety Assessment Federation (SAFed) PSG1 Pressure Systems: Guidelines on Periodicity of Examinations
- Safety Assessment Federation (SAFed) PSG2 Guidelines for the Operation of Steam Boilers
- Safety Assessment Federation (SAFed) PSG3 Guidelines for the Operation of Hot Water Boilers



- Safety Assessment Federation (SAFed) PSG4 Guidelines for the Production of Written Schemes of Examination and the Examination of Pressure Vessels Incorporating Openings to Facilitate Ready Internal Access
- Safety Assessment Federation (SAFed) SBG1 Shell Boilers: Guidelines for the Examination of Shell-to Endplate and Furnace-to Endplate Welded Joints
- Safety Assessment Federation (SAFed) SBG2 Shell Boilers: Guidelines for the Examination of Longitudinal Seams of Shell Boilers
- Engineering Equipment and Materials Users Association (EEMUA) Publication 159, Users' Guide to the Inspection, Maintenance and Repair of Above Ground Vertical Cylindrical Steel Storage Tanks
- Engineering Equipment and Materials Users Association (EEMUA) Publication 188, Guide for Establishing Operating Periods for Safety Valves
- Engineering Equipment and Materials Users Association (EEMUA) Publication 193, EEMUA Recommendations for the Training, Development and Competency Assessment of Inspection Personnel
- Engineering Equipment and Materials Users Association (EEMUA) Publication 195, Compendium of EEMUA Information Sheets on Topics Related to Pressure Containing Equipment
- Energy Institute/Institute of Petroleum, Part 12: Pressure vessel systems examination
- Energy Institute/Institute of Petroleum, Part 13: Pressure piping systems examination
- LP Gas Association (LPGA), Code of Practice 1, Bulk LPG Storage at Fixed Installations: Part 3: Examination and Inspection
- LP Gas Association (LPGA), Code of Practice 14 Hoses for the Transfer of LPG in Bulk. Installation, Inspection, Testing and Maintenance.
- LP Gas Association (LPGA), Technical Memorandum No.84: Inspection and maintenance of LPG Pipework at Commercial and Industrial Premises
- British Compressed Gases Association (BCGA) Technical Report CP23 Application of the Pressure Systems Safety Regulations 2000 to Industrial and Medical Pressure Systems at User Premises

## References

- ISO/IEC 17020, *General Criteria for the operation of various types of inspection bodies*
- Joint IAF/ILAC guidance on the application of ISO/IEC 17020, Document IAF/ILACA4:2004

## Bibliography

- SAFed Standard SS01 – *Recruitment, training and competency of engineer surveyors*
- EEMUA Publication No 193 - *Recommendations for the training, development and competency assessment of inspection personnel* {ISBN 0 85931 091 4}
- Health & Safety Executive Research Report RR 086 - *Competence assessment for the hazardous industries* {ISBN 0 7176 2167 7}
- Health and Safety Guidance, HSG 197 – *Railway safety principles and guidance: Part 3 Section A – Developing and maintaining staff competence.* {ISBN: 07 17617327}

## Summary of changes

Issue	Issue date	Summary of changes
01 Draft 1	01/July/2019	New Scheme document
01 Draft 2	17/June/2020 (Still dated 01/July/2019)	Update following ENG WG meeting
01 Draft 3	20/May/2021 (Still dated 01/July/2019)	Further Update following ENG WG meeting. (Authorised for use in development/trial phase of project)
02	01/May/2023	Finalisation and official release following completion of trial phase.