

Certification Standard: Pressure Equipment Inspectors

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CERTIFICATION STANDARD FOR PRESSURE EQUIPMENT INSPECTORS

1. CONTEXT AND SCOPE

This Certification Standard for Pressure Equipment Inspectors (CSPEI) must be read in conjunction with the Certification Standard – General Requirements (CSGR). Certification and re-certification in accordance with the CSGR and CSPEI confirms the qualifications, training, experience and examined competence of pressure equipment inspectors.

Pressure equipment inspectors must hold a relevant discipline recognition before they can hold a Competence Certificate. CSPEI and the CSGR define the criteria for the issue of Discipline Recognition to pressure equipment inspectors performing inspection of pressure equipment within the scope of the Health and Safety in Employment (Pressure Equipment, Cranes and Passenger Ropeways) Regulations 1999 (PECPR Regulations) and Pipelines Regulations 1999.

Inspectors performing activities governed by the PECPR and Pipelines Regulations must hold the required Certificates of Competence. CBIP issues Competence Certificates under delegated authority from WorkSafe New Zealand. WorkSafe NZ and International Accreditation New Zealand (IANZ) uses CBIP Inspector discipline recognition information (www.cbip.co.nz “Verify Inspector”) to verify authenticity of inspectors Competence certification status for authorisation as signatories of inspection bodies.

CSPEI defines the requirements for the issue of a Discipline Recognition to pressure equipment inspectors performing new construction, in-service inspection and repairs of boilers, pressure equipment and pipelines.

2. DISCIPLINE RECOGNITION RANGE AND ENDORSEMENTS

Candidates seeking a Discipline Recognition must satisfy the requirements of CSGR and CSPEI for their category of pressure equipment inspection discipline, for either:

- PEI, or
- PEI with Endorsement A, or
- PEI with Endorsement B, or
- PEI with Endorsement C. or
- PEI with Endorsement D.

The principal difference between a PEI and a PEI with an endorsement is that an inspector with an endorsement has demonstrated more extensive knowledge and competence typically with but not limited to:

- Equipment types and categories
- Equipment hazard levels
- Equipment management systems
- Advanced inspection and condition assessment

- Material types, properties, and treatment
- Inspection planning
- Risk assessment and management
- Training and supervision.

An inspector cannot hold discipline recognition for endorsements unless PEI is current.

Each PEI Discipline is a distinct discipline based on discrete equipment types, category and or materials. For PEI endorsements to be issued and renewed valid PEI discipline recognition and competence certification must be current.

Discipline Recognitions which may be granted under this CSPEI are:

(a) Pressure Equipment Inspector (PEI) covering:

- Pressure vessels fabricated from carbon steels without post weld heat treatment and austenitic stainless steels up to and including 316 grades (excluding heritage pressure vessels).
- Low-temperature pressure equipment (In Service Inspection only): Pressure equipment where the operating temperature is below -10° C (as defined by AS4942) to -50°C.
 - Hot water boilers.
 - Steam Boilers without superheat and associated piping systems and fabricated from carbon steels without post weld heat treatment and austenitic grades up to and including 316 grades (excluding heritage boilers).
 - Piping systems fabricated from carbon steels without post weld heat treatment and austenitic stainless steels up to and including 316 grades.
 - Steam engines covered by the PECPR Regulations (excluding heritage engines).

(b) PEI with Endorsement A, covering:

- PEI
- Steam Boilers with superheating systems, or which have parts that are subject to post weld heat treatment (excluding heritage boilers).
- Steam turbines.

(c) PEI with Endorsement B covering:

- PEI and/or PEI with endorsement A
- Pressure vessels and pressure piping that are subject to post weld heat treatment.
- Pressure vessels and pressure piping that are fabricated from materials in addition to carbon steels not requiring heat treatment and austenitic stainless steel up to grade 316.
- Boilers, pressure vessels and pressure piping that are fabricated from special materials and alloys.
- Pressure Vessels that are of lined or clad construction.

- Low Temperature Equipment (refer section 2 a). The construction/fabrication/alteration/modification/repair inspections of pressure equipment that is used for low temperature.
- Cryogenic Equipment: Pressure equipment where the operating temperature is below -50°C. The construction/fabrication/alteration/modification/repair and in service inspections of pressure equipment that is used for cryogenic service.
- Pressure Vessels that are transportable, or subject to cyclical operation in service.

(d) PEI with Endorsement C covering:

- Heritage boilers, heritage pressure vessels, and heritage engines.

Note: Heritage equipment includes a steam locomotive, traction engine, steam car, and stationary engines, boilers and pressure vessels which are generally of riveted construction and generally considered to be of heritage status.

Applicants for Pressure Equipment Inspector Endorsement C must provide documented evidence of training, qualification, skills and demonstrate proficiency with all facets of Heritage equipment covered by the scope of PEI Endorsement C and AS/NZS 3788 Appendix Y acceptable to CBIP.

Refer also CoP for Steam Driven Vehicles, New Zealand Boiler Code 1975.

(e) PEI with Endorsement D, covering:

- High Pressure Gas & Liquids Transmission Pipelines as regulated by HSAW Pipelines Regulations and in accordance with AS/NZS 2885 series Pipelines—Gas and liquid petroleum standards.

Applicants for Pressure Equipment Inspector Endorsement D must provide documented evidence of training, qualification, skills and demonstrate proficiency of HSAW Pipelines Regulations and AS/NZS 2885 Pipelines Standards acceptable to CBIP.

Refer [Appendix D](#) (Normative) for Assessment of competency and performance requirements.

3. PRE-REQUISITES FOR DISCIPLINE RECOGNITION

Candidates must:

- (a) Have a minimum of 3 years of work experience directly associated with boilers or pressure equipment in any or all of the following activities:
- design
 - construction
 - repair
 - operation, or
 - inspection.

- (b) Hold a current CBIP Certified Welding Inspector (CWI) or Senior Welding Inspector (SWI) Competence Certificate.
- (c) Have training, qualifications, and experience which demonstrate understanding of pressure equipment, categories, (and subcategories) described in AS/NZS 3788 Table 4 including its manufacture, maintenance, inspection and/or operation.

Refer to Sections 3.1, 3.2 and 3.3.

- (d) Demonstrate progress through clear and distinct training levels for each equipment category, sub-category, of section 4.2, 6.0 and [Appendix C](#) and body of knowledge until assessed as competent to gain discipline recognition for the scope of the applicable discipline. Candidates may submit alternative training, qualifications, and experience acceptable to CBIP for consideration which must provide equivalence to that listed.
- (e) Candidates for a PEI Discipline Recognition must ensure that any welding inspection documentation or reports submitted to CBIP primarily relate to fabrication, in-service welding, and repair of pressure equipment

Weld procedures are not considered sufficiently detailed evidence of welding proficiency.

Where candidates hold an existing CWI or SWI Competence they must demonstrate to CBIP that this requirement has been met by past inspection work (previous 2 years), or they must undertake additional inspection work, related to pressure equipment, to satisfy these criteria.

3.1 Training

Candidates must undertake training in pressure equipment inspection acceptable to CBIP sufficient for them to be knowledgeable in the requirements of section 6.0 and Appendix B.

Training must include knowledge requirements for inspection, including in-service inspection, e.g., by undertaking training in AS/NZS 3788 or other inspection Standard acceptable to CBIP on a variety of equipment and categories to enable CBIP to make a comprehensive assessment to achieve competencies set out in AS/NZS 4481.

3.2 Qualifications

Candidates must have a qualification such as:

- A trade qualification in a relevant engineering or inspection discipline to the satisfaction of CBIP.
- A Bachelor of Mechanical or master's degree in Engineering from a recognised technical institution, or an equivalent Technology or Science acceptable to CBIP.
- New Zealand Certificate of Engineering, e.g., Higher National Certificate in Engineering.
- 1st Class Marine Engineer's Certificate.

Candidates must provide evidence of qualifications acceptable to CBIP with their application for certification.

CBIP does not issue a schedule of recognised qualifications, therefore the applicant must provide sufficient information for an evaluation to be completed.

3.3 Experience

Candidates must have a minimum of three years' experience, acceptable to CBIP with increasing experience, in a related field to pressure equipment inspection, such as fabrication, maintenance, operation or similar experience. The experience must include fabrication inspection, in-service inspection including repairs and alterations, as a competent person or under supervision, be on a range of pressure equipment, and include documentation of results sufficient to demonstrate competence in the requirements of section 4.3, section 6 and [Appendix B](#).

4. PEI WITH ENDORSEMENT DISCIPLINE RECOGNITION

Candidates must:

- (a) hold a current Competence Certificate as a PEI for at least three years, and
- (b) hold a current CBIP CWI or SWI Competence Certificate.

4.1 Pre-Requisite for Discipline Recognition Recertification

Candidates who have held a PEI or PEI with Endorsement A, B or C Discipline Recognition, with an associated Competence Certificate, for a period of five years or more, and who carry out welding inspections as part of their pressure equipment inspection are not required to hold a current CWI or SWI.

When applying for recertification, candidates must provide evidence of welding inspection related to pressure equipment (which may be a current CWI or SWI Discipline Recognition)

Weld Procedures are not considered sufficiently detailed evidence of welding proficiency.

Candidates who have held a PEI with Endorsement A, B, C and/or D Discipline Recognition, with an associated Competence Certificate, when applying for recertification must hold a current PEI Discipline Recognition and Competence Certificate.

PEI with Endorsement C and D Discipline Recognition, recertification may require examination, or alternate assessment specified by CBIP.

4.2 Equipment Categories

Cat ID	Discipline	AS/NZS 3788 Group	Equipment Categories
1	PEI	1	BOILERS
1	PEI	1.1	Electric boilers
1	PEI	1.2	Coil-type forced circulation boilers
4	End A&B	1.3	All other boilers e.g., Indirectly fired, Waste heat boilers, Steam Generators
2	End A	1.4	Boilers with Superheat
4	End A&B	4	FIRED HEATERS OR CONVECTION BANKS
1	PEI	2	STEAM PRESSURE VESSELS
1	PEI	3	VESSELS WITH QUICK- ACTUATING CLOSURES
3	End B	5	WATER HEATERS
1	PEI	6	COMPRESSED AIR CONTAINING VESSELS
1	PEI	7	STATIC STORAGE VESSELS
1	PEI	9	PROCESS VESSELS
1	PEI	10	AUXILIARY VESSELS
1	PEI	11	REFRIGERATION AND AIR- CONDITIONING VESSELS
1	PEI	12	STATIC LOW TEMPERATURE VESSELS (BELOW –10°C) (as defined by AS4942).8
1	PEI	13	BURIED OR MOUNDED PRESSURE EQUIPMENT
1	PEI	14	PRESSURE PIPING
1	PEI	15	TRANSPORTABLE VESSELS
3	PEI End B	16	

1	PEI	17	Pressure relief devices
4	End C	18	Heritage boilers and pressure vessels
1	PEI	19	Fabrication and Repairs of pressure Equipment – PEI
4	END A&B	20	Fabrication and Repairs of pressure Equipment – PEI with endorsements A&B
5	End C	22	Heritage boilers, heritage pressure vessels, and heritage engines.
6	End D	23	High Pressure Gas & Liquids Pipelines HSAW Pipelines Regulations, AS 2885 Series

Equipment Categories adapted from AS/NZS 3788 Table 4.1

5. TRAINING EVIDENCE

Candidates must provide with their application:

- An authorised training record indicating progression through the body of knowledge and equipment categories defined in Section 4.2 and 6.0
- An affidavit signed by their employer or a competent person acceptable to CBIP which certifies that the candidate has completed the required training.

The affidavit including supporting evidence which certifies that the training meets the requirements of sections 1, 3 and 4 of AS/NZS 4481 may be accepted as complying with this provision.

Candidates who are not employees of an inspection body should refer to section 7 of the Standards for Certification – General Requirements for guidance on providing the necessary evidence of training.

When the applicant has met all eligibility requirements acceptable to CBIP for Pressure Equipment Inspector and, or endorsement discipline recognition CBIP may approve advancement to examination and certification.

6. COMPETENCY AND PERFORMANCE REQUIREMENTS

6.1 Pressure Equipment Inspector

In addition to the training, experience prerequisites, the competency and performance requirements for PEI are given below. These encompass the knowledge requirements in the examination modules. Refer Appendix B.

Element	Performance Requirements
Prepare and establish conditions for pressure equipment inspection.	(a) Inspection requirements are received, analysed, and confirmed. This includes drawings, contract, new construction, materials, fittings, bolting, welding procedures, welder qualifications, forming, cutting, welding, repairs, alterations, testing, commissioning, in-service inspection, codes standards & specifications, regulatory requirements.

	<ul style="list-style-type: none"> (b) Communications are established with customer and inspection is scheduled. (c) Resources required for the inspection are identified and established. (d) Personnel involved in the inspection are identified. (e) Preparation of pressure equipment to be inspected is established. This includes test plans (ITP's), cleaning, preservation, decommissioning. (f) A schedule of inspection activities is established.
Conduct, verify, inspect, and test pressure equipment.	<ul style="list-style-type: none"> (a) Extent of inspection required is verified. (b) Pressure equipment is inspected. This includes defects, deterioration, corrosion, safety-relief and control equipment, non-conformances, and final disposition. (c) Tests are conducted. These may include destructive, non-destructive, pressure or leak testing. (d) Documentation is analysed in accordance with code-standard-specification-contract-manufacturing- management systems and regulatory requirements.
Reports, records, and certificates of inspection.	<ul style="list-style-type: none"> (a) Inspection reports and records are made, processed, and completed to inspection body procedures and regulations. (b) Reports include all the results of inspections as well as all the information required to understand and interpret them. (c) All deviations, abnormal and hazardous conditions are reported. (d) Certificate of Inspection is recommended for issue by the inspection body in accordance with the regulatory requirements.

6.1 Pressure Equipment Inspector with Endorsements

In addition to the training, experience prerequisites, the competency and performance requirements for PEI with Endorsement are given below. These encompass the knowledge requirements in the relevant examination modules. Refer [Appendix B](#).

The required knowledge and performance requirements detailed as follows are inclusive of the competency and performance requirements for a PEI.

Element	Performance requirements
<p>Plan and prepare for inspection, conduct inspection and report on pressure equipment inspection. Scope: Relevant pressure equipment endorsements given in Clause 5.</p>	<ul style="list-style-type: none"> (a) Competency and performance requirements of a Pressure Equipment Inspector (PEI) are obtained. (b) Selection/preparation of inspections/test methods for endorsed categories and assisting in establishing criteria, where criteria do not exist or are not available. (c) Investigation and reporting of deterioration and failures in endorsed categories. (d) Approval of inspection and test plans for pressure equipment in endorsed categories. (e) Controls critical for safety in endorsed categories. (f) Assessment of pressure equipment integrity, defects, causes, repairs, and alterations. (g) Ability to gather, and understand the implications of, information on the history of equipment to be inspected.

7. EXAMINATIONS FOR DISCIPLINE RECOGNITION

The examinations for a PEI Discipline Recognition are comprised of the following papers which must be taken in the order shown:

- (a) Module 1 (Examination): Inspector’s Responsibilities and Legislative Requirements
- (b) Module 3 (Examination): Pressure Equipment Fabrication, Repairs and Alterations
- (c) Module 4 (Examination): In-service Inspection and Repair

Note 1: Sample examination questions for Modules 1, 3 and 4 are given in Appendix A.

Note 2: Equipment Categories and Knowledge requirements are described in Section 4.2 and Appendix B

Note 3: Module 2 was removed and replaced by CWI, which is a prerequisite for PEI certification.

Note 4: Approval to advance to examination will not occur until CBIP is satisfied all other prerequisites are met.

7.2 Examination References

References for completing the examinations are listed on the CBIP website at www.cbip.co.nz.

7.3 Examination Options

The candidate may nominate the applicable family of pressure vessel codes e.g. (BS/PD 5500, ASME, or AS) for examination, (Candidates may also be examined on subject matter contained

in API RP 571 Damage Mechanisms and ASME PCC-2 Repair of Pressure Equipment & Piping or other post code standard(s).

Candidates are responsible for providing their own reference Standards/Codes required for examinations. Standards/Codes may either be hardcopy, scanned or non-editable pdf (electronic), may be indexed, but shall have no additional markings that may advantage the candidate. If a candidate is found to have marked referenced standards the examination will be void.

All Examination papers may include questions that are not included in the examination reference lists: e.g., Questions designed to assess competence of PEI candidates based on, and consistent with, the scope of the PEI (and Endorsements) disciplines. Questions may be general knowledge, technical aspects, or inspection subject matter relevant to fabrication and in-service performance elements of inspection. Refer to section 6 and [Appendix B](#) Outline of Knowledge Requirements.

7.4 Examination Texts

In addition to the nominated code, NZ specific documents including the PECPR Regulations, Approved Codes of Practice, AS/NZS 3788, AS/NZS 1200 and AS/NZS 4481 should be brought by the candidate to the respective examination modules. In addition, API 571 should be brought for Modules (examinations) 4, 5 & 6.

7.5 Modules (Examinations) 1, 3 and 4

Modules 1, 3 and 4 cover fabrication and in-service inspection of the following equipment:

- (a) Pressure vessels fabricated from carbon steels without post weld heat treatment and austenitic stainless steels up to and including 316 grades.
- (b) Hot water boilers.
- (c) Boilers without superheat and associated piping systems and fabricated from carbon steels without post weld heat treatment and austenitic grades up to and including 316 grades.
- (d) Piping systems fabricated from carbon steels without post weld heat treatment and austenitic stainless steels up to and including 316 grades.
- (e) Low-temperature pressure equipment (In Service Inspection only).
- (f) Steam engines covered by the PECPR Regulations, and to the extent that it is pertinent to the inspection activities of a PEI, these modules also cover the following systems, processes, and activities:

- (g) Boiler management systems for attended unattended and limited attendance boilers.
- (h) Repairs and alterations.
- (i) Witnessing and verifying tests including mechanical testing of welding procedures during fabrication and in-service inspection.
- (j) Understanding and recognising the types and causes of deterioration and defects.
- (k) Reporting results of inspection.
- (l) Interpretation and evaluation of inspection results for pressure equipment listed above in sections a) to d).
- (m) Recommendations on future inspection periods.
- (n) Approval of inspection and test plans and preparation/approval of any specific inspection procedures required.

Sample examination questions for Modules 1, 3 and 4 are given in [Appendix A](#).

7.6 Examinations for PEI with Endorsement

The examinations for PEI with Endorsement are comprised of the following papers, in addition to those required for PEI:

- (a) PEI with endorsement A Module 5 (Examination): Inspection of Boilers, Steam Turbines and Steam Engines
- (b) PEI with endorsement B Module 6 (Examination): Inspection of pressure vessels and associated piping of any design, materials of construction and wall thickness.

Note: There may be examination for PEI with Endorsement C or D at the discretion of CBIP.

Module 5 (Examination) covers the following equipment:

- (c) Boilers with superheating systems or, which have parts that are subject to post weld heat treatment.
- (d) Steam turbines.
- (e) Other steam engines (excluding heritage engines).

Module 6 (Examination) covers the following equipment:

- (f) Pressure vessels and pressure piping that are subject to post weld heat treatment.
- (g) Pressure vessels and pressure piping that are fabricated from materials in addition to carbon steels not requiring heat treatment and austenitic stainless steel up to grade 316.
- (h) Boilers, pressure vessels and pressure piping that are fabricated from special materials and alloys.
- (i) Pressure vessels that are of lined or clad construction.
- (j) Pressure vessels that are used for low temperature or cryogenic service.
- (k) Pressure vessels that are transportable or subject to cyclical operation in service.

PEI Endorsement C and D

No specific examination is required for Discipline recognition for Endorsement C and D.

Discipline recognition may be awarded to candidates based on an assessment of prerequisites specified in sections 3.1, 3.2 and 3.5 and documented evidence of competence acceptable to CBIP, refer Certification Standard – General Requirements (CSGR), for Endorsement D, [Appendix D](#) requirements apply.

8. RECERTIFICATION

8.1 PEI

The recertification exam will comprise one paper based on Modules 1, 3 and 4.

Sample questions for Modules 1, 3 and 4 examination papers are given in Appendix A.

8.2 PEI with Endorsement A

The endorsement A recertification exam will comprise one paper based on Modules 1, 3, 4 and 5.

8.3 PEI with Endorsement B

The endorsement B recertification exam will comprise one paper based on Modules 1, 3, 4, and Module 6.

8.4 PEI with Endorsement C and PEI Endorsement D

Applicants for Endorsement C and D must have 3 years' experience minimum as PEI prior to application for Endorsement C and D.

Endorsement C and D may require certification or recertification by examination.

8.5 Knowledge Requirements

The knowledge requirements underlying the examination papers for pressure equipment inspectors are given in Section 6.0 and [Appendix B](#).

8.6 Exemptions from Examination

CBIP may consider applications for exemption from examination modules, but there will be no exemptions for PEI Module 1 Examination paper.

Application for exemptions from examination papers must be made in accordance with the requirements of the CSGR.

9. TRAINEE INSPECTORS

Trainees must note that it is the responsibility of their employer to ensure that:

- (a) Trainees are able to work safely.
- (b) Trainees are trained and supervised in accordance with the requirements of [Appendix C](#).

APPENDIX A. SAMPLE EXAMINATION QUESTIONS: INFORMATIVE

All module (examination) papers are open book.

The module examinations questions are in a multi-choice format, on the subject matter given in the competency and knowledge requirements for the relevant module.

Sample questions for Modules 1, 2 and 4 with * showing the correct answer.

Module 1: Inspector's Responsibilities and Legislative Requirements

- Q1 In the Approved Code of Practice for Pressure Equipment, a change to the design of, adding to or taking elements away from pressure equipment is a:
- (a) repair
 - (b) change
 - (c) alteration*
 - (d) modification
- Q2 According to the Approved Code of Practice for Pressure Equipment, a fault inherent in a particular kind of equipment, resulting from deficiencies in the design or manufacturing process, that may cause serious harm to a person is called a:
- (e) type fault*
 - (f) defect
 - (g) imperfection
 - (h) flaw
- Q3 According to the Approved Code of Practice for Pressure Equipment, the use of an alternative material is to have the agreement of the _____, unless otherwise permitted by a trade agreement, AS/NZS 1200 or, an 'Enquiry Case' or other mechanism of the standard concerned:
- (a) manufacturer
 - (b) inspector
 - (c) end user
 - (d) purchaser*
- Q4 According to the Approved Code of Practice for Pressure Equipment, unless amended by the Code pressure vessels must be designed in accordance with:
- (a) AS/NZS 3788
 - (b) AS/NZS 1200*
 - (c) BS EN 288
 - (d) PD 5500

- Q5 According to the Approved Code of Practice for Pressure Equipment, ammonia pipe work constructed to ASME B31.5 must be inspected and tested in accordance with:
- (a) Section 3.7.2 of the Approved Code of Practice
 - (b) AS/NZS 1200
 - (c) ASME B31.5
 - (d) Chapter VI of ASME B31.3*
- Q6 According to the Requirements for Inspection Body Accreditation in New Zealand, an inspection report must include:
- (a) Date of Inspection
 - (b) Description of subcontracted work
 - (c) Information of what has been omitted from the original scope of work
 - (d) All of the above*

Module 3: Pressure equipment fabrication

- Q1 According to the PECPR Regulations, a pressure vessel means an unfired vessel used to hold, transport, store, or use:
- (a) Gases at pressure exceeding 50 kPag
 - (b) Liquids at pressure exceeding 50 kPag
 - (c) Steam
 - (d) & (b)
 - (e) & (b) & (c)*

Question 2 to Question 4 is general knowledge and should be answered regarding welded fabrication technology

- Q2 The type of document that describes the requirements for a given material is commonly referred to as:
- (a) a code
 - (b) a standard
 - (c) a specification*
 - (d) and (b) above
- Q3 What is the effect of Sulphur when it has been incorporated into the steel?
- (a) affects the machinability of the steel
 - (b) makes the material prone to solidification 'hot' cracking*
 - (c) improves the hardness of the material

- (d) improves the impact strength of the steel
- Q4 Which element has the greatest effect on steel regarding its susceptibility to cracking:
- (a) nickel
 - (b) manganese
 - (c) copper
 - (d) carbon*
- Q5 According to the PD 5500, radiographic acceptance levels for isolated pores in materials of 8mm thick is:
- (a) 3.0mm
 - (b) 4.5mm
 - (c) 6.0mm
 - (d) 2.0mm*
- Q6 According to the General Requirements of ASME VIII Div. 1, where a steel plate edge is cut by thermal cutting any detrimental discoloration must be:
- (a) removed by mechanical means*
 - (b) accepted after inspecting to see if the surface roughness is acceptable
 - (c) examined using magnetic particle inspection
 - (d) without any further inspection or preparation
- Q7 According to the General Requirements of ASME VIII where magnetic particle examination is prescribed it must be done by in accordance with:
- (a) ASME V
 - (b) ASNT CP 189
 - (c) Appendix 6*
 - (d) ASNT SNT TC 1A
- Q8 According to the Approval testing fusion welding procedure requirements of PD 5500 Section V all welding must be carried out with a welding procedure which conforms to:
- (a) BS EN 287 Pt 2
 - (b) BS EN 288 Pt 2*
 - (c) BS EN 287 Pt 1
 - (d) BS EN 288 Pt 3

Module 4: In-Service Inspection

- Q1 Ultrasonic wall thickness testing must be carried out to:
- (a) AS 1710
 - (b) AS 2452.3*
 - (c) AS 2452.1
 - (d) AS 2452.2
- Q2 According to AS/NZS 3788 the assessment of planar defects may be carried out per AS/NZS 3788 on vessels that operate in the temperature range of:
- (a) 0°C to 400°C*
 - (b) 20°C to 400°C
 - (c) -20°C to 350°C
 - (d) Nothing is specified in AS/NZS 3788
- Q3 According to AS/NZS 3788 static pressure vessels containing a liquefied petroleum gas the maximum nominal period for internal inspection is every:
- (a) 10 years*
 - (b) 4 years
 - (c) 2 years
 - (d) 12 years
- Q4 According to AS/NZS 3788, during the inspection of a drum for transporting liquefied gas, a dent is discovered with 140 mm diameter and 15mm depth in the shell. This condition is:
- (a) acceptable
 - (b) not acceptable*
 - (c) may be accepted by the owner
 - (d) may be accepted by a registered design engineer
- Q5 According to AS/NZS 3788 Type IV cracking occurs in the HAZ of 2Cr2Mo3V, in steel pipes, operating at temperatures above:
- (a) 730°C
 - (b) 640°C
 - (c) 500°C
 - (d) 540°C*
- Q6 When performing a hydrostatic pressure test at a pressure of 3Mpa, the pressure gauge used must be graduated to:
- (a) approximately five times the test pressure

- (b) approximately one and half times the test pressure
- (c) approximately three times the test pressure
- (d) approximately twice the test pressure*

Q7 According to the Approved Code of Practice for Boilers, an Unattended Boiler constructed after 1996 must have the following controls:

- (a) Feed water availability alarm
- (b) Steam temperature and pressure controls
- (c) Flame detector or ionisation rod flame monitoring to supervise pilot flame
- (d) All of the above*

APPENDIX B. OUTLINE OF KNOWLEDGE REQUIREMENTS: NORMATIVE

B.1. General Requirements

B1.1 Introduction

It is an important factor in the safe and reliable operation of any facility, to ensure mechanical integrity, reliability, safety and fitness for purpose and service. It is therefore essential that the inspectors who perform the inspection functions have the necessary knowledge to be competent in the inspections that they perform to provide value to the client and recommend to the Inspection Body that a certificate of inspection be issued.

The following sub-sections define the core requirements to guide candidates on the extent of knowledge required to be prepared for both the examinations and their future work. Modules 1 to 4 define the requirements and depth of knowledge for the Pressure Equipment Inspector (PEI) and modules 5 and 6 outline the PEI with endorsements.

AS/NZS 3788 is a recognised text containing the core requirements for pressure equipment inspection.

B1.2 Process operation

It is essential that the inspector understands the pressure equipment operational process to identify where and what corrosion/degradation mechanisms are expected and consequently where to concentrate the inspection effort.

B1.3 Metallurgical and corrosion degradation mechanisms

The inspector must understand the pressure equipment operational conditions and underlying reasons that dictate materials selection and the interpretation of the relevant standards and codes of practice in respect to material selection, and damage mechanisms. The inspector must have a thorough knowledge of damage mechanisms affecting the categories of pressure equipment categories specified in section 4.2. Refer also AS/NZS 3788 Appendix M

B1.4 Metallurgy and Welding

Welding knowledge is taken as a prerequisite by means of the candidate having to have done the CWI Certification prior to doing the PEI Certification. As a minimum, the inspector must understand:

- (a) The criteria that dictate the selection of materials including the iron/carbon phase diagrams and the effect of alloying on the properties of materials.
- (b) mechanical testing and acceptance criteria for materials and weldments.

- (c) the relationship between metal properties and the phenomena of fatigue, ductile and brittle fracture, and embrittlement.
- (d) knowledge of fundamentals of composition and structures of metallic materials and their responses to heat treatment both during manufacturing and welding.
- (e) the codes and standards that pertain to welding procedures, welder qualifications and associated consumables.
- (f) the various forms of welding techniques as well as the QA and QC procedures that apply to the common welding processes i.e., SMAW, GMAW, FCAW, GTAW, SAW.

B1.5 Inspection techniques and NDT

The inspector must understand the applicability, safety and accuracy of various methods and inspection techniques (invasive and non-invasive) used to detect manufacturing defects or degradation mechanisms in all types of pressure equipment and service. Appropriate techniques used and commonly applied include visual, functionality testing (relief valves), destructive testing, condition monitoring, radiographic and ultrasonic, eddy current electromagnetic and other NDT techniques.

The Inspector must recognise the limitations of the various methods and techniques and take this into account when deciding on the values of that employed (i.e., it may be necessary to supplement the method or techniques used with another one to increase confidence). His/her knowledge of this subject should be such that he/she can converse with specialists in the field and evaluate the results of their examinations. Training in the methods and techniques of NDT is only required to create an awareness of NDT methods and their application; it is not required for inspectors to execute routine NDT activities. For these activities certified NDT technicians must be used.

B1.6 Mechanical Maintenance

The Inspector must be aware of the purpose, tasks, and roles of the maintenance function. He/she should have a clear understanding of its routine and non-routine activities (e.g., shutdowns) and constraints (work preparation, planning, financial considerations, expenditure control, impact of work volume generated by inspection, reliability, etc.)

B1.7 Design and manufacturing codes and standards, and methods of manufacturing, inspection, and repair.

The inspector must have sound detailed knowledge and experience in the use of the codes and standards covering design, manufacturing, and repair, to ensure compliance with the applicable norms. Familiarisation with the full range of standards relevant to static and transportable equipment and piping systems published by AS, ASME, ASME/ANSI, TEMA and British Standards is essential. The inspector must understand the fundamental principles within the standards sufficiently to resolve any conflict between them and to advise their client of their applicability. The inspector must have a thorough knowledge of Approved Code of Practice Pressure Equipment Appendix D and K.

It is not the intention that the inspector should be fully conversant with every aspect of every Standard, but that the Technical Manager of Inspection Body (as defined in ISO 17020), employing the inspectors must be capable of providing detailed technical backup on request.

It is essential that the inspectors are fully aware with the requirements for the development, review and implementation of Inspection and Test Plans (ITP's)

B1.8 Special tools

The inspector must be aware of all tools available to determine "fitness for purpose" of equipment (e.g., finite element analysis and fracture mechanics). He/she must recognise the limitations of the various tools and take this into account when deciding on the values of the methods and techniques employed (i.e., it may be necessary to supplement the method used with another one to increase confidence). Also Refer AS/NZS 3788 Section 5 and Section 7, Appendices N and O.

B1.9 Inspection methodologies

The inspector must be knowledgeable about selective risk-based inspection methodologies and any other reliability methodology to optimise equipment inspection intervals. He/she must be capable of participating in multi-disciplinary teams to develop, implement or maintain this methodology for the relevant plant. Also refer AS/NZS 3788 Section 4.5 and Appendix B.

B1.10 Quality Assurance Systems

The inspector must be aware of Quality Assurance and Quality Control concepts/systems e.g., ISO 9000 standards.

B1.11 Record keeping and report writing

The inspector must be capable of preparing and maintaining accurate and proper records and reports of all relevant inspections to build up the necessary historic data to maintain the reliability of the equipment and meet statutory requirements.

B2 Pressure Equipment Inspectors

The PEI can carry out the majority of the fabrication and in-service inspections required in New Zealand. The range of inspections generally carried out by the PEI is defined in Clause 6.1.4. The depth of knowledge required is defined in modules 1, 3 and 4.

B3 Pressure Equipment Inspectors with specific Endorsements

The PEI with endorsements can carry out the fabrication and in-service inspections of pressure equipment requiring certification. The range of endorsements is given in Clause 1.2. The depth of knowledge required is defined in modules 1, 3 and 4 (i.e., PEI) and the relevant endorsements A and B knowledge required from Module 5 and module 6.

The additional knowledge requirement for PEI with Endorsement C is AS/NZS 3788 Appendix Y.

The additional knowledge requirements for PEI with Endorsement D are based on AS 2885 series of standards.

A primary role of the PEI with Endorsements A or B is the implementation and review of the fabrication and in-service inspections of high hazard level plant typically located in, but not restricted to, the petrochemical, process and power industries and any specialised pressure equipment that requires specific knowledge.

B4 Knowledge requirements are based on:

Modules 1,3 &4 are for PEI

Modules 1,3 & 4 plus Module 5 and/or Module 6 for PEI with Endorsements A or B.

APPENDIX C. TRAINEE PRESSURE EQUIPMENT INSPECTORS: NORMATIVE

Refer IANZ AS IB C1.5 Supplementary requirements for Accreditation - PECPR Regulations: Minimum Requirements for Effective Supervision, Equipment Inspectors and Training Systems.

C1 General

Inspection bodies and other employers of trainee inspectors are responsible for ensuring that trainee inspectors are given appropriate training and effective supervision.

Employers of trainee inspectors must maintain training records within their quality management system that cover both the theoretical and practical aspects of the training their trainees receive. Training records must be endorsed by a competent person (authorised training supervisor) acceptable to CBIP.

Training programmes should be structured so that trainees' progress through consecutive levels of technical complexity, categories of equipment (refer 3.4) and supervision in a process that ensures the quality of their inspection output is equal to that of a fully competent inspector.

C2 Trainee levels

The trainee levels should be arranged so that at:

- The first level the trainees work is overseen by a supervisor who is always present during an inspection.
- The final level before attaining a Discipline Recognition/Competence Certificate the trainee may be assigned work, which is overseen by a supervisor who is not necessarily present at the worksite but, who is available to make visits and to give any other assistance the trainee may require.

The number of levels between first and final in a training programme will depend on the training procedures of the inspection body and the complexity of the inspector discipline in which the trainee is engaged. However, all training programmes must conform to the following:

1. Supervisors of trainees must hold the CBIP Competence Certificate that is most relevant to the training programme and have had at least five years' experience following certification.
2. Training programmes must cover the "Knowledge Requirements" of the relevant inspection discipline Standards for Certification.
3. Details of each item of training given to trainees must be reported in the training records and certified by the trainee as having been received. The supervisor must record and certify whether the trainee is competent in that aspect of inspection or give details of further training that is required.
4. Trainees must enter a training programme at the first level of training and not enter the next level (or subsequent levels) until they have completed all items of training at their current level and been certified as competent in each by their supervisor.

5. Training records must be audited internally by a technical manager of an inspection body or other competent person acceptable to CBIP.
6. Supervisors must review all inspection reports prepared by trainees and make recommendations on issue of equipment certification.
7. Training records must be kept and made available during assessment of trainees for signatory status and for external audits of the inspection body.

C3 Trainees and effective supervision

Refer <https://www.ianz.govt.nz/programmes/inspection-bodies> Accreditation Criteria Supplementary Criteria PECPR Regulations: Effective Supervision.

APPENDIX D. ENDORSEMENT D ASSESSMENT CRITERIA: NORMATIVE

Applicants for PEI Endorsement D must demonstrate experience, proficiency, and competence with the aspects of gas and liquids pipelines of HSAW Pipelines and AS 2885 standards acceptable to CBIP.

The following are the criteria for assessment of applicants applying for PEI Endorsement D.

Applicants must demonstrate a thorough knowledge, experience, and competence in all aspects of pipeline fabrication and in service inspection acceptable to CBIP, typically including but not limited to: -

1. Pipeline Regulations, and the relationship between Pipeline, PECPR Regulations.

Including: -

NZS 5223: Code of practice for high pressure gas petroleum liquids pipelines

ASME B 31.8 Gas Transmission and Distribution Piping Systems

ASME B 31.4 Pipeline Transportation Systems for Liquids and Slurries

ASME B 31.3 ASME Code for Pressure Piping

2. Demonstrate a thorough knowledge of and application of AS 2885 Series of Standards:

AS 2885.0: General requirements

AS 2885.1 Design and construction

AS 2885.2: Welding

AS 2885.3: Operation and maintenance

AS 2885.4: Submarine pipeline systems

AS 2885.5: Field pressure testing

AS 2885.6: Pipeline safety management

3. Be Trained, qualified, experienced, and competent with the application of:

Pipeline Management Systems (PMS)

Pipeline operating procedures

Overpressure protection requirements

Pipeline owner responsibilities, and accountability

Management system audits

Pipeline Integrity Management Plans (PIMP)

Inspection & Test Plans

Pipeline Safety Management Studies

Threat identification, analysis, mitigation, and control

Location Classification

Spill & Explosion analysis and radiation contours

Volcanic & Seismic effects, and analysis

Pipeline intrusion, external incidents, and Reporting

Electrical interference

Change of service, suspension, or abandonment

Feature & Artefact assessment

Pipeline Authorisations & Easements

Elements of Easement Management Contracts

Landownership & Communications

Route hazards, identification, and signage

4. Provide evidence of a minimum of 3 years fabrication and in-service inspection of pipelines post PEI Certification including but not limited to:

Station Piping

Pump & Valve stations

Vessels, filters, pig launchers and receivers

Pig Signals

Flange insulating kits

Geospatial (GIS) & Proprietary Information systems

Geotechnical reports

Cathodic protection reports

Pipeline surveillance reports

In line Inspection reports

DCVG reports

5. Demonstrate a thorough knowledge of non-intrusive inspection & testing techniques and methods

Cathodic protection principles, protection requirements – data analysis

DCVG

Pipeline cleaning – pigging

Intelligent pigging & data review and assessment including non-destructive testing

Verification excavations

Feature / Artefact verification, assessment, FFS & Remaining life

6. Demonstrate a thorough knowledge of pipeline Geotechnical aspects: -
 - Depth of cover
 - Excavation and backfill
 - Pipeline integrity and support
 - Anchoring, slatting / rock-shields
 - Road, Rail Crossings, reinforcement / protection
 - River crossings & protection
 - Swamp weights
 - Line stops
7. Demonstrate a thorough knowledge of Pipeline external protection: -
 - Coating and wrapping systems, selection, application, inspection, and test.
 - Examination of and integrity of external coatings of pipes and weld joints
 - Holiday testing of protective coatings, wraps
8. Demonstrate a thorough knowledge of pipeline material selection application, fabrication, inspection, test: -
 - Material selection and application including material grades and impact testing requirements.
 - Qualification of Welding on "live equipment" Hot Tapping procedures
 - Qualification of welders/welding operators
 - Repair welding on live pipelines
 - Re-rating / Derating of pipelines
 - Hydrostatic testing of the pipelines
 - Earthing, bonding and isolation requirements.