

INFORMATION FOR APPLICANTS

FOR
CERTIFICATES OF COMPETENCY AND RENEWAL AND RE-CERTIFICATION OF CERTIFICATES
FOR
In-Service Inspector, Pressure Equipment
Senior In-Service Inspector, Pressure Equipment

CONTENTS

1. INTRODUCTION
2. AICIP
3. EXAMINATION DATES & VENUES
4. COMPETENCY REQUIREMENTS
5. TYPES OF EXAMINATIONS
6. SUGGESTED PRIOR ATTRIBUTES FOR APPLICANTS
7. RECOGNITION OF PRIOR LEARNING (RPL)
8. RECOMMENDED PRIOR STUDY
9. APPLICATION PROCEDURE
10. FEES
11. GUIDE FOR SITTING EXAMINATIONS
12. ASSESSMENT
13. RESULTS
14. CERTIFICATION
15. RE-EXAMINATION
16. CERTIFICATE VALIDITY
17. RENEWAL OF CERTIFICATES
18. RE-CERTIFICATION
19. CERTIFICATE WITHDRAWAL
20. APPEALS
21. FURTHER INFORMATION AND REFERENCES (See Note page 5)

Attachments For Information Pack

		Page No
AICIP 004 Rev14	“Information for Applicants”, (August 2007)	pages 1 -11
AICIP 035 Rev20	Schedule A – Examination Dates and Fees, (August 2007))	page 12
AICIP-007 Rev21	Guidance Notes on Application for AICIP Certificates, Renewal and Re-certification	page 13
AICIP-005 Rev3	Application Form for Certification, Renewal and Re-certification (August 2007)	pages 14-17
AICIP-021 Rev3	Appendix 1 – Typical Examination Questions, (August 2007)	pages 19-29
AICIP-003 Rev2	Competencies for In-Service Inspectors of Pressure Equipment, (August 2007)	pages 30-33
AICIP-051 Rev1	Advice for Candidates for AICIP 2008 Examinations	pages 35-38

[Note: Main changes from Rev 13 are indicated by vertical line on Left]

1. INTRODUCTION

This revised brochure is the result of eleven years development and experience in the certification of over 399 in-service inspectors many of whom have helped improve the whole certification process.

Regulatory and micro-economic reforms in Australian States and Territories during 1990s resulted in the important industry safety controls of design verification, fabrication and in-service inspection of pressure equipment no longer being carried out by Regulatory Authorities.

This has put full responsibility for these controls to be made by Industry itself (i.e. greater self-regulation). Thus designers, manufacturers, owners and users of important pressure equipment need to ensure in-service safety through the use of competent personnel and suitable practices.

To provide assurance to industry of the competence of inspectors and to ensure a future supply of inspection personnel, the Pressure Equipment industry agreed that a national system for certification of personnel was needed and this should be able to satisfy:

- AS/NZS 3788:1996 Pressure Equipment - In-Service Inspection. (revised in 2006)
- AS/NZS 4481:1997 - Pressure Equipment - Competencies of Inspectors.
- SAA/NZS MP76:1997 Miscellaneous Publication - Pressure Equipment - Inspection bodies and personnel.
- Industries' and inspectors' needs.
- Where practicable, general requirements of the Australian National Training Authority (ANTA) (replaced by Department of Education).

To develop and implement the national system for certification, AICIP was formed in November 1995 with the initial focus on the Pressure Equipment Industry. WTIA, NATA, and others made major contributions in the initial formation and constitution of AICIP.

Then it was agreed that design verifiers certification would be handled by IE.Aust and Welding/Fabrication Inspectors by WTIA. In-Service Inspectors of Pressure Equipment would be handled by AICIP itself and the national system would only address the generic competencies for each type of inspector which will cover almost all industries' general requirements. Also, the successful inspector will be judged by AICIP to have those competencies on the day of the examinations for certification or re-certification. The employer is therefore responsible to ensure:

- a) any further special additional competency needed to satisfy the owner; and
- b) the day-to-day competence of employee inspectors.

To meet industry's needs, AICIP agreed to develop an overall system as soon as possible. WorkCover Authority of NSW provided valuable support in the development of the examination system and initial exams. The first examinations were held in June/July 1997 with 30 applicants and again in October 1997 with 40 applicants. By the end of December 2007, there had been 559 applicants. Table 1 shows data for the first 10 years.

DATE	ISI Sat	SISI Sat	ISI Issued	SISI Issued
1997	70	24	34	11
1998	49	7	26	4
1999	54	7	38	4
2000	29	6	17	1
2001	60	8	31	6
2002	64	13	24	4
2003	59	12	23	6
2004	71	14	30	7
2005	48	5	28	0
2006	53	10	22	0
2007	57	5	35	0
TOTAL	614	111	397	43

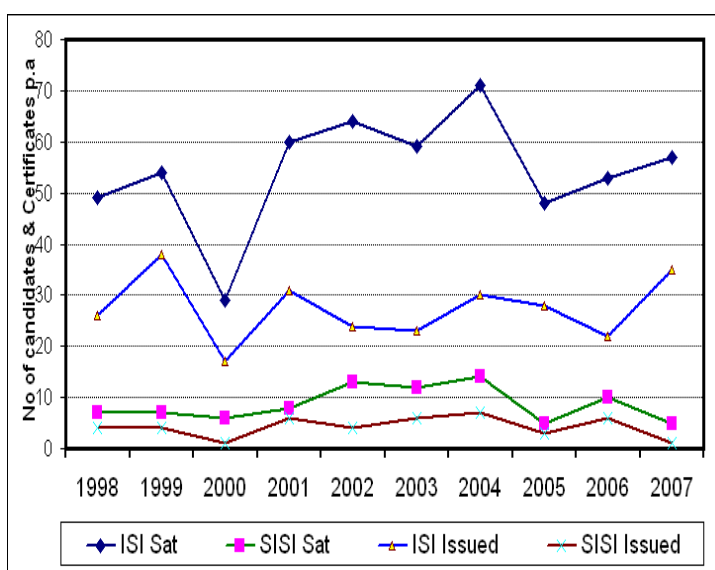


Table 1. AICIP Certification 1997-2007

This document gives guidelines aimed to help applicants to prepare for the examinations for pressure equipment in-service inspectors and for renewal and re-certification.

2. AICIP

What is AICIP?

AICIP is the Australian Institute for Certification of Inspection Personnel. It is an independent national body set up by the industry to examine inspectors and issue certificates of competency for inspectors of various equipment and engineered plant. It is a not-for-profit body being incorporated to serve all of Australia. There has been strong links with the Certification Board for Inspection Personnel (CBIP) of New Zealand. Australian law required the use of "Institute" rather than "Board".

Who are its representatives?

The Institute's foundation membership included the following organisations:

- ACA * Australasian Corrosion Association
- AINDT * Australian Institute for Non-Destructive Testing
- AIES * Australasian Institute of Engineering Surveyors
- AMEI * Compressed Air Association of Australasia (CAAA) Div of AMEI
- B&PVMAA * Boiler & Pressure Vessel Manufacturers Association of Australia (now PEAI)
- IE AUST * Institution of Engineers, Australia (now Engineers Australia)
- MESA Maintenance Engineering Society of Australia
- NATA * National Association of Testing Authorities, Australia
- SAI * Standards Australia International (now Standards Australia)
- WHS Queensland * Division of Workplace Health & Safety
- WTIA * Welding Technology Institute of Australia

Current members are shown with an *

The Institute's Committee of Management meets at least twice per year and WTIA acts as Secretariat for AICIP.

What are AICIP's responsibilities?

Overall management of assessment, examination, certification, renewal and re-certification including:

- Use of a fully documented management system to AS ISO/IEC 17024:2004 Conformity assessment - General requirements for bodies operating certification of persons.
- Approval of examiners with wide experience in in-service inspection and competence to conduct examinations in accordance with the approved procedures.
- Audit and review of performance of the whole certification system.
- Resolution of any disputes.
- Report to industry and members.
- Maintenance of a National Register of Certificated Inspectors both in hard copy and on the Internet (www.wtia.com.au).
- Continual improvement of the system including feedback for Standards and training.
- Assurance of transparency, integrity and equity of the system.

How is AICIP financed?

- Committee members provide voluntary support for meetings.
- The Panel of Examiners and user bodies also provide significant voluntary help.
- Industry has supplied valuable specimens for practical exams.
- Applicants fees contribute to examinations, certification, registration, meetings and administration facilities i.e, office, printing, postage, phone etc.

How does the Certification process work?

Certification is achieved by:

- Assessment and checking of applications
- Conducting appropriate examinations by a Panel of Examiners consisting of approved assessors (examiners and invigilators).

3. EXAMINATION DATES & VENUES

Refer to attached Schedule A for examination dates and venues.

The dates and venues will be arranged in various centres throughout the country to suit the demand in different areas. Special arrangements may be made for candidates in remote locations for approved invigilators to conduct the examinations.

4. COMPETENCY REQUIREMENTS

An applicant must demonstrate thorough knowledge, skills and ability that the competencies given in document AICIP-003 can be responsibly and consistently applied.

- *Competency* “comprises knowledge and skills and the consistent application of that knowledge and skills to the standard of performance required in employment”. AICIP does not specify how competency is gained.
- *Competent Person* usually means “a person who has acquired through training, qualification, or experience, or a combination of these, the knowledge and skills enabling that person to perform the task required”.

5. TYPES OF EXAMINATIONS

- The examinations are for two types of inspectors for Boilers, Pressure Vessels and Pressure Piping ie. In-service Inspector (ISI) and Senior In-service Inspector (SISI).
- Examinations are written and practical covering the competencies given in document AICIP-003 Rev 2 and may include supplementary oral examinations in special cases.
- Questions for written examinations may be multiple choice, short answers and essay type.
- Examinations, other than SISI “C” paper, are currently closed book with any essential data supplied.
- Some parts of the examination may be open book or appropriate data supplied. Applicants will be advised if reference Standards are required.
- For written examinations, a blue or black pen is needed and sometimes a simple calculator. Normally applicants need a pen, pencil, torch, mirror, ultrasonic thickness gauge and a ruler for the practical exam.
- Maximum marks and any time limits for each question will be shown.
- The examinations for **In-service Inspectors** consists of two written Papers A and B each 3 hrs duration, and a practical examination paper E of 3 hours duration for each applicant.
- The examinations for **Senior In-service Inspectors** consists of two papers – C of 1 ¼ hours duration and paper D of 2 hours duration. Applicants for this examination need to have passed or be sitting for the ISI examination (A, B & E).
- The joint examination for **re-certification** of In-service Inspectors and Senior In-service Inspectors consists of one written Paper “F” of 2 hours duration.
- Examinations are under the control of an approved invigilator.

6. SUGGESTED PRIOR ATTRIBUTES OF APPLICANTS

At present, there are no prior qualifications, training and experience specified for AICIP In-service Inspector Examinations.

Two early sets of In-Service Inspector examinations however, resulted in overall pass rates of 73% and as low as 33% although there was little or no difference in the standard of marking of the examinations. Investigation suggested the lower rate was due largely to candidates having an insufficient combination of prior qualifications, training, study and experience.

To have a reasonable likelihood of demonstrating the required competency and passing the **ISI** examinations (and to limit cost), it is suggested that applicants have at least the following:

- Qualifications - Year 12 High School, a Trade Certificate or equivalent knowledge.
 - Knowledge of common pressure equipment types and terminology and AS/NZS 3788. – Basic mathematics ability eg. determine the volume of a cylinder.
- Training - 100 hours formal, self or on-job training in pressure equipment inspection and AS/NZS 3788.

- Experience - depending on qualifications and training, 5 years (full time equivalent) including ½ year in inspection. Shorter times apply where qualifications and training are high but experience should be sufficient to develop basic technical skills and good communication skills.
- Personal
 - ability to read, write and communicate orally in the English language.
 - maturity and reliability, eyesight and hearing (with or without correction) and physical and mental ability to competently perform the proposed inspections

Note: Many of the above attributes are assessed in the examinations, but they, and the ability to inspect at heights, in confined spaces, underwater etc, are also assessed by the employer and the inspector (via a code of ethics) as required.

For **SISI** applicants wider experience and calculation and technical ability is desirable in addition to the above.

7. RECOGNITION OF PRIOR LEARNING (RPL)

This refers to “the acknowledgement of the skills and knowledge held as a result of formal training and/or education, work experience and/or life experience”.

AICIP has in effect recognised prior learning by having a minimum of prerequisites for sitting for the examinations i.e. has complied with AS 4481. This has made the examination unique as the only means of equitably assessing competency.

Applicants’ CVs and evidence of “prior learning” are however used to:

- advise applicants on their suitability of examinations; and
- to moderate examination results in border-line cases.

World practice for similar certification by examination requires certain pre-requisites e.g. specified qualifications, training and experience. It does not provide exemption from examinations because of RPL. AICIP’s ultimate objective is to have its certification recognised globally and comply with a truly international standard.

8. RECOMMENDED PRIOR STUDY AND TRAINING

It is recommended that the applicant reviews knowledge and skills for the competencies given in document AICIP-003. To assist the applicant, this includes references for the relevant paragraph or section in AS/NZS 3788-2006 Pressure Equipment – In-service Inspection and other standards or documents,

AS/NZS 3788 is the main basis for the examinations and it references some parts of other Standards which may be used for questions where relevant. Examples include:

AS 1210	Pressure vessels (primarily typical joint arrangements and general construction).
AS 1228	Boilers (for main types of boilers and typical construction).
AS 1271	Safety valves, other valves, liquid level gauges, and other fittings for boilers and pressure vessels (for terminology and basic requirements only).
AS 2593	Boilers - Safety management, and supervision systems (for safety controls).
AS 3873	Pressure equipment - Operation and maintenance (for owners’ role in inspection).
AS 3892	Pressure equipment - Installation (for inspection at installation).
AS 4343	Pressure equipment – Hazard levels
NOHSC	National Standard for Plant (for principles and registration of designs of hazard level A, B, C or D pressure equipment, and individual items of hazard level A, B or C equipment). Note: This Standard may be difficult to access, but most States/Territories regulations are similar. It is currently being revised.

AICIP 021 3 gives further guidance with sample questions and answers.

AICIP does not conduct training courses to ensure maximum impartiality in assessment of candidates but has provided feedback to training bodies e.g.

- Chisholm Institute of TAFE – Victoria
- Australian Corrosion Association – Victoria
- TAFESA – Panorama Campus – South Australia
- Central TAFE – Western Australia
- Some TAFEs and companies also provide courses at various times.

9. APPLICATION PROCEDURE

Application for certification should be made on the application form in the attached document AICIP 005.

Note The form requires applicants to agree to:

- abide by the nominated code of ethics or equivalent
- have their name, postcode and certificate number and type available to the public via the AICIP National Register and the website (see page 1) and if advised by the applicants also includes contact details.
- advise AICIP when they no longer wish to practice as an AICIP Certificated Inspector and to return the certificate.

Applications for examinations and the relevant fee and photographs must be received at the AICIP Secretariat at least two weeks prior to the start of the relevant series of examinations.

The applications will be reviewed for completeness, and the applicant will be advised of acceptance for the examinations, details of the examinations times and venues, or further information required. For examinations at remote venues a minimum of four weeks notice is required.

Application for renewal – see Section 17, and for **re-certification** – see Section 18.

10. FEES

Refer to attached Schedule A, page 12, examination dates and venues.

Adjustments:

- Fees may be adjusted at appropriate times but any increase will exceed CPI rises rounded to the nearest \$10.
- Although it is anticipated that applicants for examinations can attend major examination centres for the one fixed fee, special fees may need to be negotiated for special circumstances eg., remote locations.

NOTE: The 2008 fees allow for an effective 11.5% compound increase in CPI (reduced by GST) since fees were determined in 1997.

11. GUIDE FOR SITTING EXAMS

11.1 Purpose

This section is intended to guide candidates how to tackle examinations – as many are not familiar with procedures or practices. AICIP examinations are primarily aimed at assessing knowledge and skill (i.e. competency) related to inspection. AICIP examiners do not assess examination technique, writing skill or grammar but need to understand answers.

11.2 **Studying for Certification** The following is recommended:

- Firstly, get data on the certificate desired i.e. title, any prerequisites, guidance information, dates and location of examinations.
- Determine whether you will be eligible to sit the examination. If in doubt check with AICIP.
- Determine your method of studying – self, colleagues, training courses (face-to-face or correspondence), on-job, at-home etc. All candidates should do some training, studying of reference data and Standards, and practice related to each certificate, examination and competencies to be assessed.
- It is recommended that you review and understand the main elements of references suggested for the examination. Do this over a period to suit your knowledge and experience.
- During study it is wise to underline the most important elements or add special notes to your Standard or Notes so that these can be re-read a few days before the examination.

11.3 Preparation for Examinations

Firstly:

- Make application for the particular examination(s) i.e. name, date and location. See application form for details and guidance on the various examinations for each certificate.
- Ensure your application has been successful and your examination number, date and location of the examination are clear. AICIP will advise.

At least a week before the examinations:

- Check what examinations you are sitting and dates, times and location of examination.
- Reference Standards are not permitted to be taken into the examinations unless previously notified by AICIP.
- Check all equipment needed for examination. (See Section 5).
- Collect evidence of permission to sit and your examination number.

Within a day or two of the examination

- Check transport arrangements.
- Review the text you have specially marked in your Standard or Notes.
- On the night before the examination, get to bed a little earlier than normal.

11.4 Doing the Examinations

Preliminary

- Get to the examination centre with all required documents and gear about ½ hour before the examination time, preferably without rush and allow for parking etc.
- Identify yourself with the Invigilator, sign the examination attendance register and collect the examination paper. It is also the answer book.
- Follow guidance given by the Invigilator on timing, conduct etc. All examinations may not start at the same time and some may be staggered e.g. for practical examinations if there are many candidates.
- Use the preliminary reading time to read special instructions and details given in the examination paper and each question to:
 - a) Identify those questions which are compulsory or optional and double check the finish time of your paper.
 - b) Select the optional questions you propose to undertake (if in doubt only select at this stage those that you feel most comfortable with).
 - c) Allocate the order of tackling questions to suit yourself. Usually, those you know well first.
 - d) Allocate a reasonable time for each question e.g. for a 3 hour examination (180 minutes) for 100 marks, means a question worth 5 marks should have about 9 minutes – possibly a little less if you know it very well or little more to be expansive.
 - e) If repeating an examination keep in mind questions and layout may be different in the new examination. Each examination is different.
- The practical examinations require inspections to be performed under real service conditions. Please treat it that way i.e. not just an examination, but an assessment under real conditions usually with little or no input from the Invigilator and sometimes not ideal conditions.
- If in real doubt, ask the Invigilator.

Starting

- When starting, add only your examination number (no names) and re-read each question carefully to make sure what is wanted e.g. list, identify, sketch, comment, explain, report, inspect, assess, criticise, test etc. These action words have specific meanings and should be followed. More than one action may be required e.g. list and explain. On your first quick reading you may have misread something and re-reading is a check. Possibly mark the key action words as a guide.
- Answers can often be given as dot points like this guide, even in a formal inspection report to a customer.
- Avoid repeating anything in the question except one or two key words. This saves your time (and that of the examiners).

- Please write clearly in black or blue ink in the place provided – i.e. not on loose pages as this normally will be ignored or can be misplaced. Sometimes notes can help examiners. Abbreviation such as “NDT” are “ok”. Answers written in pencil (except for diagrams) will not be accepted.
- Supplementary information may be provided in the paper to assist in answering, and can be removed if desired, provided you note on the paper this has been done.
- After completing about $\frac{1}{4}$ of the examination, check your timing to see that you are proceeding to plan and modify if necessary. Time management is important.
- The Invigilator will usually advise you about 15 minutes before the finish. Don’t panic.
- If you are running out of time and know some parts of questions, possibly allow one or two minutes to answer these parts – particularly if the questions are worth many marks. Even key words here can indicate your knowledge and gain marks – more than if you don’t attempt.
- If you have some time left after answering all questions, use the time to review the question and answer – particularly for questions worth many marks.
- If something goes wrong – e.g. your calculator or thickness gauge is playing up or you are ill – ask the invigilator for help.

Finish

- Hand in your completed paper to the invigilator and sign the examination attendance register.
- If required answer a brief questionnaire on your views of the examination – these will not influence your marks in any way but will help improve future exams.

Conduct during examination. Please ensure:

- Mobile phones comply with invigilator requirements, normally retained by the invigilator (turned off) but in special cases may be “on”, with the invigilators permission.
- No talking or communicating in any way with other candidates; this might be construed as cheating.
- No use of any notes other than those authorised or supplied.
- Any specific instructions are complied with.

12. ASSESSMENT OF EXAMINATIONS

- Papers and Invigilator comments are assessed by at least two examiners highly experienced in the subject and who only know the candidate’s examination number.
- Answers are assessed against a set of standard answers but allowance is made for difficulty. No marks are deducted for poor spelling, layout, or writing unless unreadable.
- Final marks are usually the average of the examiners’ marks.
- Marks close to a pass are “moderated” i.e. a third examiner may be requested to review the marked papers.
- A pass in the examination requires at least 70% average of the papers in the examination and at least 50% in each paper, except for the re-certification exam (paper F) SISI require at least 75%.

The pass percentages allow for restricted time in re-checking answers, recognition we all don’t know every thing, lack of access to notes, possible misinterpretation and understanding of the questions, and in-practice an inspector often needs to get more data.

13. RESULTS**Notification of Examination Results**

- Results will be not given via the telephone. They will be given in writing to you or your nominee.
- Marking of papers is normally completed within 8 weeks and notified ASAP by telephone, fax or e-mail, and then by post. Your contact details will be as last notified by you.
- To be fair to everybody, all results for the one series of examinations are released together.

Remember, the examination is also considered to be part of your training and learning.

If you pass, good work – but remember a 75% mark suggests you might not know or be skilled in 25% or more. Keep in mind your code of ethics – don’t tackle work unless you feel competent for that work. You may need specific study or advice to ensure this.

If you fail, we know you will be disappointed – so will trainers and examiners; and please don't blame everyone else; it maybe the way you tackled the examinations.

- Contact AICIP if you desire feedback of what went wrong e.g. where your answers were significantly below par or where AICIP might have done better. In both cases, results may also indicate areas for improvement. For such feedback applicants need to agree they are not eligible for a re-mark.
- Candidates who sit for both In-Service Inspector and Senior In-Service Inspector examinations and fail the In-Service Inspector examination will not have their Senior In-Service Inspector examination assessed until a pass is gained in the ISI examination. No refunds will be allowed.
- If a candidate does not achieve an average of 70%, he/she may hold without re- examination (see section 15), any paper in which 70% or over was obtained providing a minimum of 50% was achieved in each of the remaining papers.
- Candidates who gain less than 50% in any paper, may not hold any paper.
- An applicant is entitled to a re-mark subject to an application and prior payment of a fee equal to the cost of the examination for the failed paper(s). Re-mark will normally be done by another examiner.

14. CERTIFICATION

A nationally recognised certificate and wallet card (signed with photo) will be provided by AICIP to each successful applicant within approximately ten weeks of the examination. AICIP will also include the name and postcode of the successful applicant in the National Register of Certificated Inspectors and, if agreed by the applicant, contact details will also be added on the Internet. The Certificate and wallet card remains the property of AICIP.

15. RE-EXAMINATION

Candidates who fail the examination may be re-examined in the papers which are not held.

A new application (without photographs and copies of certificates etc) is to be submitted together with the appropriate fee.

For a pass on re-examination, an average of 70% must be obtained in the papers taken and held as well as a minimum of 50% being obtained in each paper.

Papers can be held for up to two subsequent re-examinations but not longer than two years from the date of the examination. Failure to pass at the third attempt means that no paper can be held for the next re-examination and all papers must be taken again.

16. CERTIFICATE VALIDITY

Certificates remain in force for a period of five years from the date of issue after which time renewal, re-certification or return is necessary.

Following satisfactory investigation by AICIP a replacement certificate may be issued for a lost or stolen certificate.

17. RENEWAL

Timing: Renewal of certificates for ISI and SISI certificated inspectors is required within 5 years and 2 months from date of first issue of the ISI certificate. Then every 5 years alternatively, re-certification (see 18) and renewal are required. See Figure 1. To simplify and reduce cost, of renewal and re-certification for continued competency of SISI is done at the same time as for ISI.

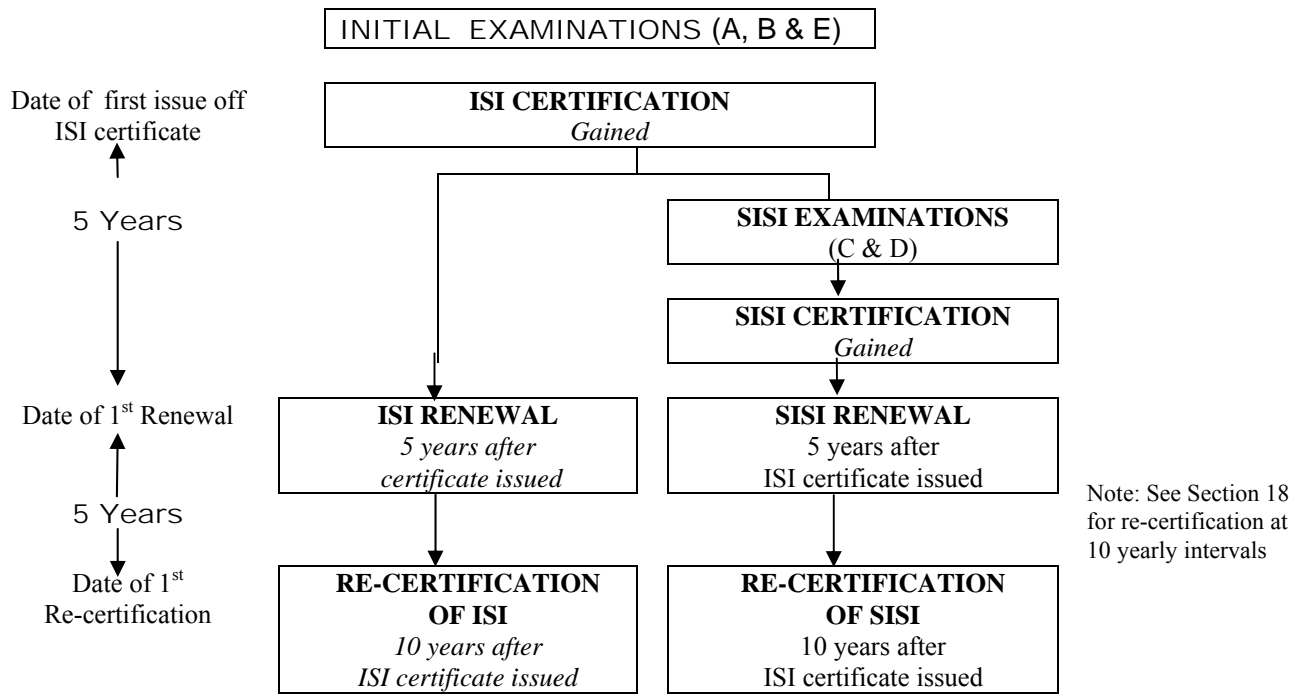


Figure 1. Renewal and Re-certification

Basis: Certificate renewal is based upon AICIP being satisfied that inspectors have maintained their inspection competence and familiarity with the pressure equipment industry. Evidence of such contact as detailed below is submitted to AICIP and considered by the Assessment Panel. Further assessment by interview or examination may be requested in special cases at the discretion of the Assessment Panel.

SPECIAL CIRCUMSTANCES

If a person is not active in Australian Industry due to special circumstances, certification can be renewed for the remaining time period of the 5 year renewal at full cost. Examples of this include, a person working overseas, paternity leave, serious illness, retrenchment.

Further clarification of this is for example, if such a person renewed two years after the original renewal date due to special circumstances they would still pay the full cost for the five year renewal and the new renewal period would be for the remaining three years of the original of the five year period.

Application: For renewal, the Inspector must complete and sign the attached Application Form AICIP 005 and provide clear evidence of:

- a) A minimum of 24 months inspection practice over the 5 years since first certificated has been spent on ISI, SISI or directly related “Inspection activities”. This time must include some inspection within the last 3 years, and may include relevant training, conferences, meetings and supervision of other inspectors or inspection activities.
- b) Having “inspected” at least 3 different major types of the equipment listed on page 4 of the Application Form.
- c) Having had at least 100 hours acceptable Continuing Professional Development (CPD) in the previous 5 years.
- d) Reviewed any amended or new relevant Standards and regulations.
- e) Suitable resolution of any significant documented complaint received .

Certificate holders will be give a minimum of two months notice prior to the expiry date of their certification; and their renewal application must be received one month after the expiry date.

The Inspector must also:

- i) Provide copies of 4 different inspection or other relevant reports;
- ii) Sign the declaration to abide by the Code of Ethics and agree with AICIP registration conditions.
- iii) Consider himself/herself competent for continued inspection of pressure equipment.

Non Renewal: If renewal is not received by the above date, AICIP will remove the Inspector's name from the current register and web-site.

18. RE-CERTIFICATION

Re-certification of inspectors is required within 10 years and 2 months from date of first issue of the ISI certificate and every 10 years thereafter. See Figure 1.

Re-certification will be based on assessment:

- a) using the procedure and requirements as for "renewal", and
- b) a two hour written examination.

This examination:

- i) is comparable with similar re-certification systems overseas to enhance international benchmarking and the credibility of inspectors and Australian industry.
- ii) is aimed primarily to establish that the inspector has kept pace with changes in laws, standards, technology and industry and society expectations, and is still competent.
- iii) primarily relates to the inspector's scope of work over the last 5 years i.e. the types of inspections and equipment.
- iv) applies to both ISI and SISI
- v) will contain questions similar to those in AICIP 021 for papers A, B, D and E and including practical assessments based on photographs or samples.

Marking (see Section 12), notification, certification, appeals etc will be as for the normal examinations. A new certificate and wallet card will be issued to successful inspectors.

Where an inspector cannot conveniently attend the normal examination venue, the inspector may arrange for the examination to be conducted at a suitable location by an approved Invigilator i.e. an invigilator already approved by AICIP or others who:

- are shown to be of high integrity;
- have no conflict of interest (i.e. independent and not a relation or colleague);
- sign the Invigilators acceptance and examination forms and declares that the examination has been conducted in accordance with the AICIP Rules and without any assistance to the inspector. This declaration is to be witnessed by e.g. Justice of the Peace, Police Officer, Clergyman, Head Teacher or equivalent (e.g. Chartered or Registered Professional Engineer); and
- are approved by AICIP

Any extra cost should be borne by the inspector, and suitable time must be allowed for postage of examination papers.

19. CERTIFICATE WITHDRAWAL

AICIP reserves the right to withdraw any certificate where a complaint that there has been a serious incompetence or serious departure from the code of ethics by the holder, is proven to the satisfaction of the AICIP Committee.

20. APPEALS

Appeal against any decision of AICIP regarding certification may be made by, or on behalf of, an applicant, provided it is in writing and gives full details of reasons and justification of the appeal.

21. FURTHER INFORMATION AND REFERENCES

To obtain an information package or any further information please contact the AICIP Secretariat on the address given on page 1.

Information Package and reference details are given on page 1.

EXAMINATION DATES AND FEES - 2009

1. DATES

ISI paper A Written	Nationally	30 th March 2009	7 th September 2009	am
ISI paper B Written	Nationally	30 th March 2009	7 th September 2009	pm
ISI paper E Practical *	Nationally	TBA	TBA	am & pm
SISI papers C & D Written	Nationally	31 st March 2009	8 th September 2009	am & pm
ISI/SISI Paper F Written	Nationally	30 th March 2009	7 th September 2009	am

* For other centres and examination dates applicants will be advised as soon as practical.

2. VENUE EXAMINATION CENTRES TYPICALLY INCLUDE (ACCORDING TO APPLICANT INTEREST)

- Brisbane
- Melbourne
- Special Centres by agreement
- Sydney
- Adelaide
- Perth
- Darwin

3. EXAMINATIONS DURATION

In-Service Inspector - Pressure Equipment

Paper A	09:00 - 12:10	ie 10 minutes preliminary reading	+ 3 hours answering
Paper B	13:00 - 16:10	“ “ “ “ “ “	“ “
Paper E	am or pm to suit	“ “ “ “ “ “	“ “

Note: For Paper E when there are large numbers of applicants, the availability of specimens may require staggering of times within an overall examination time of 4 hours. The total time for each candidate is 3 hours 10 minutes.

Senior In-Service Inspector - Pressure Equipment

Paper C	09:00 - 10:20	ie 5 minutes preliminary reading	+ 1 ¼ hours answering
Paper D	10:30 - 12:35	“ “ “ “ “ “	+ 2 “

All Inspectors - Re-certification examination

Paper F	09:00 - 11:05	ie 5 minutes preliminary reading	+ 2 hours answering
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4. FEES

Fees for assessment, examination and certification (from January 2008):

In-Service Inspector (ISI)	\$750 + 10% GST = \$825 *
Re-sit for each paper	\$310 + 10% GST = \$341 *
Senior In-Service Inspector SISI	\$420 + 10% GST = \$462 *
Re-sit for each paper	\$250 + 10% GST = \$275 *

Fee for assessment and renewal of certificate (from January 2008): \$750 + 10% GST = \$825

Fee for assessment, examination and re-certification (from January 2008): \$750 + 10% GST = \$825

* Plus any extra-ordinary costs incurred by AICIP for the examination e.g. transport of samples.

- All fees are to be paid and documentation finalised prior to the applicant being allowed to sit the examination.
- All applications for examination should be received at the AICIP Head Office by 5pm on **27th February 2009** and 5pm on **7 August 2009**.
- An additional late application fee of \$60.50 will be charged after this date.

Notification of cancellation in writing by **7th March 2009** and **15th August 2009** will not be subject to a cancellation fee. Cancellation after this date will incur the 100% examination fee

GUIDANCE NOTES ON APPLICATION FOR AICIP CERTIFICATES, RENEWAL AND RE-CERTIFICATION

For new Certificates Notes 1-6 apply. For Renewal and Re-certification Notes 1, 4, 5 and 7 apply.

1. APPLICATIONS

Applications, must be made on the attached standard form and should be legible, preferably typed or neatly written in black ink. All attachments are to be clearly identified, signed, dated and be sufficiently clear to permit legible photocopying.

2. EDUCATION AND TRAINING

Applicants, other than for Renewal or Re-certification will:

- a) need to supply copies of any engineering degrees, diplomas, certificates or other institutional qualifications held in engineering or other relevant disciplines; and
- b) normally need to have attended a training program (this is not mandatory) or undertaken self-study, based on the main elements of AS/NZS 3788 and have relevant practical experience for the certificate sought.

Note: Key areas for training or self-study should include: the Inspector's duties and responsibilities; basic engineering principles; types of pressure equipment; in-service Inspection practice; examination and non-destructive testing methods and uses; elements of corrosion and basic metallurgy, and elementary design and evaluation of equipment integrity.

Reference should be made for guidance to appropriate Standards and Regulations e.g: AS/NZS 3788, AS 1210,, AS 1228, AS 4041, AS 4343 or other comparable recognised standards. The examination is not to establish intimate knowledge and competence with all relevant standards which might be used in In-Service Inspection.

3. BACKGROUND/EXPERIENCE RESUME

Applicants, other than for Renewal or Re-certification should give a brief history of relevant background experience as follows:

- a) A short curriculum vitae (CV), including employment record at least since the date of key qualifications. This record should identify work in the technical field relevant to the application, and provide dates and some approximate times where possible.
- b) A brief description of work undertaken by the applicant in the last two or three years, which relate specifically to the certificate sought. The responsibility held and the role played by the applicant in each project must be described together with the name of the person to whom the applicant was responsible.
- c) A brief description of other related activities which can assist in the assessment of current technical competence.

4. FEES

See Section 10 AICIP 004 Rev 13: "Information for Applicants for "Certificate of Competency and Renewal" or Schedule A. (AICIP 035).

5. DECLARATION

- a) Certificates, renewals and re-certification are only issued on the following conditions:
 - i) The Institute has the right to withdraw registration and refuse renewal, if negligent or grossly incompetent inspection by the certificated Inspector is proven to the satisfaction of the Institute.
 - ii) The certificated Inspector only inspects in accordance with a suitable management system, the category certificated, and code of ethics which complies with SAA/NZS MP76:1997 (Appendix B).
- b) Witness is to be a Justice of the Peace, a Police Officer, Clergyman or equivalent. (eg. chartered or registered professional engineer).

6. RESERVATION

Based on the recommendation of the AICIP Assessment Panel, the Institute may:

- i) accept or decline the application;
- ii) defer the application and request any further information needed; or
- iii) advise the applicant of a more appropriate certification level.

7. RENEWAL AND RE-CERTIFICATION (See also Section 17 & 18 of AICIP 004 Rev 13)

Applicants for renewal of a Certificate or re-certification need to:

- Complete and sign the application form – (pages 2, 4 and 5 only of AICIP 005 Rev 3);
- Comply with Note 5 above– Declaration;
- Attach copies of 5 reports for verification of experience;
- Attach two passport photographs and the fee (see Note 4 above);
- Ensure information is verifiable from diaries, reports, employers or customers; and
- Add signed extra pages if the space provided is insufficient.

APPLICANT'S RESUME FOR NEW CERTIFICATION

NAME

QUALIFICATIONS

(please use abbreviations)

	Title	Body and Location	Date
Trade Qualification/Certificates			
Associate Diploma, Advanced Certificate			
University Degree			
Other			

IN-SERVICE INSPECTOR TRAINING

(Please exclude qualifications listed above. List training location, equivalent full time hours and dates).

	Course/Training	Body and Location	Hours	Dates
Self Education & (Correspondence)				
Education body (TAFE, ACA, Central TAFE (WA), TAFESA-Panorama) etc.				
Employer (In house training)				
Other				

EXPERIENCE

(Please indicate appropriate background experience in equivalent full time years)

	Main Duties	Employer	Years
General Engineering- Office			
General Engineering - Office			
In-service Inspecting			

Applicant's Signature: _____

SUPPORTING INFORMATION FOR RENEWAL OR RECERTIFICATION

(Other format giving the same information may be used).

1. INSPECTION PRACTICE

Months (Full Time) for the following years
(must cover at least the last 3 years and be a total at item 22 of 24 months. You should be able to provide evidence at least over the last 3 years)

No	PRESSURE EQUIPMENT INSPECTION OR ACTION INVOLVED (Must cover at least 3 different equipment types)	1 ST Year	2 nd Year	3rd Year	4 th Year	5 th Year	Total
1	Boilers – Fire tube, water tube, electric, locomotive etc.						
2	Air Receivers						
3	Unfired Pressure Vessels – Stationary and Process						
4	Heat Exchangers, Coolers or Condensers						
5	Fired Heaters						
6	Deaerators						
7	Buried or Mounded Pressure Vessels						
8	Vessels with Quick Actuating Closures						
9	Static Cryogenic Vessels						
10	Transportable Vessels						
11	Pressure Piping						
12	Liquefied Gas Transport Drums						
13	Idle Pressure Equipment						
14	Low Pressure Storage Tanks						
15	Pressure Relief Valves and Devices						
16	Boiler or Safety Control Systems						
17	Gas Cylinders						
18	Hydraulic Pressure Equipment						
19	Planning, Inspection Programmes or Advising Inspectors						
20	Training/Supervising Trainees On-The-Job						
21	CPD (see section 3 below)						
22	MINIMUM TOTAL REQUIRED = 24 MONTHS						MAXIMUM 60 MONTHS

2. VERIFICATION OF EXPERIENCE

- .1 Attach clearly identified copies of 5 typical inspection or other relevant reports supporting the range of equipment/activities involved.
- .2 Provide contact details of employers or 5 customers who can confirm work (at least the last 3 years).* details must be provided

INSPECTION ACTIVITY (SEE NO ABOVE)	EMPLOYER AND/OR CUSTOMERS				TOTAL HOURS *
	Date*	Company*	Contact Name*	Telephone No*	

Inspector's AICIP No: _____ Signature _____

AICIP Use Only

Person(s) Contacted: _____

SUPPORTING INFORMATION FOR RENEWAL OR RE-CERTIFICATION (Cont'd)

(Other format giving the same information may be used).

3. CONTINUING PROFESSIONAL DEVELOPMENT (CPD) (over the last 5 years)

TYPE		TITLE/ DESCRIPTION	BODY/PROVIDER (AND CONTRACT DETAILS)	CREDIT TOTAL HOURS INVOLVED (NOTE 1 BELOW)
a)	Qualifications or Awards gained (since application for initial ISI or SISI Certificate)			
				(max. = 50)
b)	Formal Education Training Courses (other than a)			
				(max. = 50)
c)	Conferences, Seminars, Professional meetings			
				(max. = 20)
d)	Presentation of Papers or Lectures			
				(max. = 20)
e)	Informal learning (private study) (Note 1 below)			
				(max = 50)
f)	Informal learning (on-the -job training)			
				(max. = 20)
g)	Service activity to others eg. examiner, audit, reviews, committee meetings			
				(max. = 20)
h)	Review of AS/NZS 3788 or Regulations			(min. = 1) (max. = 5)
				(min. = 1) (max. = 5)
				(min. = 1) (max. = 5)
				(min. = 1) (max. = 5)
MINIMUM TOTAL CPD REQUIRED: 100 HRS				

Note 1. Credited hours = total hours involved except for (e) where only half the actual hours can be accredited.

Inspector's AICIP No: _____ Signature _____

<i>AICIP Use Only</i>	<i>Date</i>	Confirmed CPD Marked
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EXTRACT FROM SAA/NZS MP76:1997

APPENDIX B
CODE OF ETHICS
(Normative)

B1 GENERAL This Appendix sets out the ethics which inspection bodies and personnel are obliged to adopt, as a condition of their accreditation and certification to this document. Alternatively, the codes of ethics required by the Certification Board for Inspection Personnel, New Zealand, the Australian Institute for the Certification of Inspection Personnel, the Institute of Professional Engineers New Zealand, the Institution of Engineers Australia or equivalent bodies may be used.

Departures from this Code of Ethics may, upon proper complaint and investigation, result in appropriate action by the certification body, regulatory authority, client or others.

B2 PRINCIPLES AND TENETS APPLYING TO THE INSPECTION OF PRESSURE EQUIPMENT Inspection bodies and personnel certificated to this document shall conduct their business affairs in a manner that demonstrates the following:

- (a) *Commitment* Endeavour to safeguard the welfare, health and safety of the community and its environment and give this priority before sectional or private interest.
- (b) *Integrity* Inspection bodies and personnel shall –
 - (i) act with integrity, honesty and impartiality in work for clients and others;
and
 - (ii) not knowingly act, assist or engage in fraudulent or dishonest work or practices.
- (c) *Competence* Perform work only within their areas of competence, i.e. within their capability, qualifications, training and experience.
- (d) *Performance* Inspection bodies and personnel shall –
 - (i) apply skill and knowledge in their work for, and in the interests of, their client and employers;
 - (ii) carry out work in a proper, impartial and proficient manner; and
 - (iii) compete fairly without inducements to secure work.
- (e) *No conflict of interest* To avoid potential conflict between the interests of clients, employers or the public and where this is unavoidable disclose forthwith the circumstances which may cause conflict.
- (f) *Confidentiality* To ensure that confidential or copyright information or material obtained in the course of work, is transferred to other parties only with written authority from a duly authorised person.
- (g) *Reporting* Inspection bodies and personnel shall –
 - (i) give reports, evidence, opinions or statements in an accurate, objective and truthful manner;
 - (ii) ensure reports and documents are based on adequate knowledge, identify interest, and state any limitations or conditions; and
 - (iii) inform clients and employers when, in the interest of health and safety, further work is required or that work is outside their competence.
- (h) *Improvement* Inspection bodies and personnel shall continue to improve their competence (knowledge and skill) to match changes in technology.

SAMPLE EXAMINATION QUESTIONS AND ANSWERS**General Notes:**

1. It is suggested that applicants attempt these questions before looking at the answers.
2. In the examination, any essential extract from AS/NZS 3788 or other documents will be supplied, unless applicants are notified to bring AS/NZS 3788 etc.
3. Underlined words are important in understanding questions.
4. Answers to each question are generally presented in order of importance.

PAPER A - PRELIMINARY AND GENERAL PRACTICE**Total Marks = 100**

1. Identify the most appropriate answer using letter and number:
 - a) When it is necessary to alter operating conditions outside the limits of the original design of a large pressure vessel, the owner should ensure that the calculations justifying the proposed alteration have been verified by:
 - i) an in-service inspector
 - ii) the manufacturer
 - iii) a design verifier
 - iv) the person responsible for the operation of the equipment (1 mark)
 - b) Resistance to brittle fracture in weldable ferritic steels is more conveniently assessed by:
 - i) Charpy impact test
 - ii) nick break test
 - iii) percentage elongation and reduction of area.
 - iv) bend test (1 mark)
 - c) In horizontal pressure piping not near supports and bends where the main loading is from internal pressure, the maximum general stresses are:
 - i) located near the top of the pipe
 - ii) directed around the pipe
 - iii) directed across the circumferential welds
 - iv) located at the bottom of the pipe (1 mark)
2. a) List four technical objectives of pressure equipment inspection. (2 marks)
3. a) What do you understand by the terms
 - i) “Minimum allowable thickness after forming”(MAF) of a dished end
 - ii) “Corrosion allowance”(CA)? (2 marks)
4. List any eight commissioning and initial inspections required of the owner/inspector to ensure that a 10MW water tube boiler is safe to operate. (5 marks)
5. An organisation with three small air receivers requires your advice on how to satisfy the safety requirements of the National Standard for Plant or your local Regulations. What general advice would you provide? (5 marks)

PAPER B - INSPECTION PRACTICE FOR SPECIFIC EQUIPMENT Total Marks = 100

1. As an independent inspector write a brief report to the equipment owner describing what you did and the outcome of your inspection for **any one** item of equipment in question 3. (10 marks)

[Note: This could list any five common types of equipment covered in AS/NZS 3788 eg Appendices. E-K, P-T and W – each having specific inspection needs.

2. Pitting corrosion up to 1mm deep is detected locally in the shell of a small 1MPa boiler after 10 years of excellent service with negligible metal loss up to the previous inspection 1 year ago. What action(s) would you take as an inspector to assist your client? (5 marks)

PAPER E - PRACTICAL EXERCISES**Total Marks = 100**EXERCISE NO. 1

The two specimens in this exercise represent two critical areas of carbon steel pressure equipment which are suspect because of probable erosion/corrosion. Using your ultrasonic thickness gauge, measure the approximate minimum thickness of the material in the marked area of each specimen and its position and also the area of thinning.

- a) Record as working notes in your answer book, the minimum thickness and position on each specimen. (Maximum 15 minutes) (6 marks)

THEN MOVE TO YOUR DESK TO ANSWER THE REMAINING PARTS OF THIS EXERCISE

- b) List the main parts of the procedure you adopted in this test. (3 marks)
- c) Write brief recommendations to your employer. (3 marks)
- d) What different actions would you have taken if the material was aluminium 5083 plate. (3 marks)

Total 15 marksEXERCISE NO.2

As an independent inspector you are requested by the plant operator to urgently carry out a periodic inspection for the first time to show that the vessel (in the examination room) is “safe” for continued service so that the owner can comply with the National Standard for Plant.

Vessel details are:

- manufactured in 1975, installed in 1977 (see nameplate)
- located outside the building in a highly industrialised area (or seaboard or inland)
- reported to normally contain non-harmful gas supplied by the compressor at 1.0 MPa and 90°C
- assume the volume is 100L and any defects are assessed by AS/NZS 3788 Appendix W.
- no manufacturer’s data report or previous inspection documents are available.

Applicants are requested not to remove any sticker on the vessel.

THEN MOVE TO YOUR DESK TO ANSWER THE REMAINING PARTS OF THIS EXERCISE

The vessel in the examination room cannot be moved or operated during the examination. Extracts from AS/NZS 3788, AS 3920.1 and National Standard for Plant which are relevant are attached to assist in answers.

Conduct the inspection of the exhibited vessel and record your essential observations as working notes in your answer book. (maximum 15 minutes) (5 marks)

EXERCISES 3 to 9 or 10 may include (Each 5 – 20 marks)

These may consist of one or more of the following:

- Test to locate leak in a vessel.
- Identify where on a particular pressure equipment thorough inspection is required and why.
- Assess a weld you have asked to be radiographed, and its radiograph and the NATA test report for acceptability. Partial but not full interpretation of the radiograph is required.
- Determine the acceptability of a dent, corrosion or erosion.
- Inspect a newly installed pressure relief valve.
- Assess the suitability of safety controls mounted on a particular item of pressure equipment
- Review a P&ID for acceptability - for isolation prior to entry into equipment; or. for safety of connection between high pressure equipment and low pressure equipment.
- Assess a weld with an imperfection for various types of service.
- Comment on probable cause of failure of equipment. (Note: Samples are real failures)
- Suggest the most probable “failure mode” (or damage mechanism)
- Inspect internally part of a vessel by VT using torch and mirror.
- Measure corrosion depth from corroded side.

PAPER C SISI CALCULATIONS	TOTAL MARKS = 60
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1. A short horizontal cylindrical pressure vessel suffers from heavy external corrosion damage in the form of local wastage over an area of 2000 mm². What would be your recommendations on the need to de-rate the design pressure of the vessel at the same design temperature, for each of the following conditions:
 - A. The remaining wall thickness at the thinnest point is equal to the design thickness.
 - B. The minimum mean thickness t_m over the wasted area is 19.5mm.
 - C. The minimum mean thickness t_m over the wasted area is 10mm?.

The following data is given:

Nominal thickness of the affected carbon steel plate is 25mm.

Vessel mean diameter is 1500mm

The wasted area is 50mm x 40mm ($L_a \times L_h$), is not near any weld, opening or support, and its dimensions cannot be changed.

Design pressure is 2 MPa; and the design strength of the plate material is 100MPa at the design temperature.

Measures have been taken to ensure future corrosion is nil.

Data from AS/NZS 3788 is supplied (applicants will be advised if the examination is an open book and requires this Standard) (20 marks)

PAPER D SENIOR INSPECTION	TOTAL MARK = 60
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1. a) Explain what you understand by “risk management”, “risk assessment” and “quality assurance” and identify the main differences between them. (10 marks)

PAPER F RE-CERTIFICATION EXAMINATION

TOTAL MARK = 100

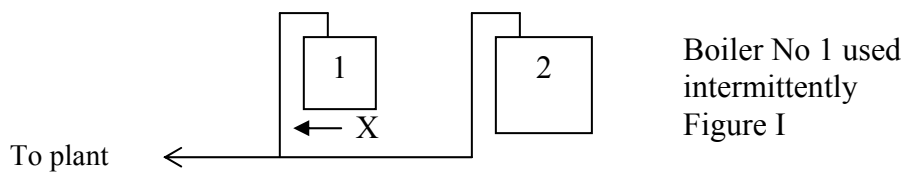
Note:

Questions may be the same as for Papers A, B, D and E. *(approximately 1 minute/per mark)*

1. Identify the main Act or Regulations which apply directly to your inspections. *(5 marks)*
2. Good communication is an important feature of inspection.

Please describe clearly and briefly with dot points an actual case where you encountered wrong information supplied to you and its effect. *(10 marks)*

3. Figure 1 shows the layout of a piping system where a thermal fatigue crack was detected around the inside of a vertical pipe at position X approximately 0.5 m above the main. *(10 marks)*



Please suggest a cause and a modification to avoid further cracking.

4. Figure 2 shows a sample cut from a refinery pipe to investigate leakage from inside. *(10 marks)*



Figure 2

Please propose:

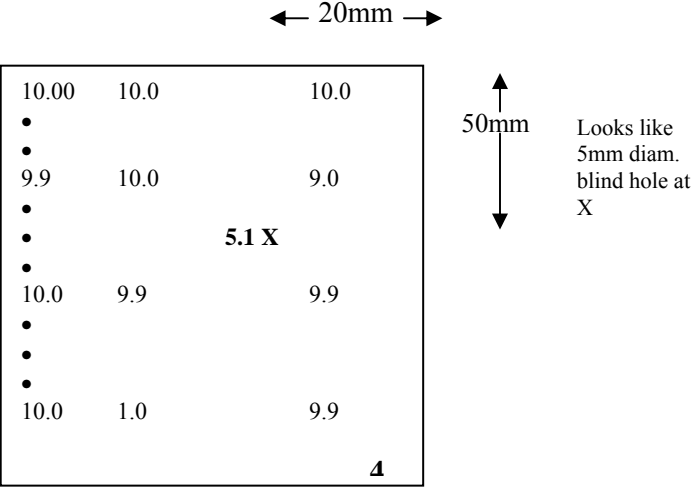
- a) the most probable failure mode (or damage mechanism).
- b) how to detect this in other joints before leakage
- c) how might it be avoided.

ANSWERS TO PAPER A


Question	Answers (Comments for Applicants in Brackets)	AS/NZS 3788 or other
1.(a)	iii) [Alterations ie changes which affect safety usually require some design. For hazard levels A,B & C & D design verification and registration is needed with boilers and pressure vessels].	1.4.1, 6.1 & AS 3920.1
1.(b)	i) [BF is a serious type of sudden failure in ferritic steels due to low toughness at low temperature in presence of notches. CV test is used for parent material, weld and HAZ].	5.2.5.1(b) T.3.1(b) D15.4, M8
1.(c)	ii) [Without bending or restraint, hoop stress is twice axial stress in pipe, pressure vessels, boilers and cylinders; hence greater importance of axial type defects].	I.2 (AS 4041)
2.(a)	<ul style="list-style-type: none"> • promote the safety and health. • assist in ensuring that pressure equipment is safe and can perform reliably until the next planned inspection. • verify that the fabrication (MDR) and commissioning data complies. • assist in ensuring that maintenance, repairs, and alterations are carried out without decreasing integrity. • indicate early warning of repairs, replacements or alterations. • assess remaining safe life. • help owners comply with occupational health and safety legislation. • assess performance of new design, material fabrication etc. • investigate failures, dangerous incidents (near misses), reduced performance, or abnormal conditions. 	2.1
3.(a)	<p>i) MAF – is designer or purchaser advice for the minimum acceptable thickness (usually in the knuckle radius where thinning occurs during forming) before going into service. It includes CA. [Some areas may be over 10% thicker than design minimum thickness and can tolerate more corrosion than the knuckle.]</p> <p>ii) CA – the designer’s or purchaser’s allowance to cater for the loss of thickness due to in-service corrosion (including erosion etc) over equipment life.</p>	AS 3788 and AS 1210
4	<p>a) All necessary safety devices are fitted and operate correctly.</p> <p>b) Supervise, witness or verify any site pressure tests.</p> <p>c) Pressure equipment is clearly identified and registered.</p> <p>d) Update records including drawings & instructions.</p> <p>e) Verify design, manufacture and installation (eg MDR etc) are complete.</p> <p>f) Spot check original thickness as convenient.</p> <p>g) Check protective coating (insulation etc).</p> <p>h) Check that no extraneous material is left in the pressure equipment.</p> <p>i) Ensure valid certificate of inspection.</p> <p>j) Check dimensions of equipment in the temperature creep range.</p> <p>k) Verify special operational and performance tests are successfully completed.</p>	4.2
5.	<ul style="list-style-type: none"> • ensure vessel’s safety devices and inter connections are safe. • indicate hazards (eg. pressure energy – burst, projectile, jet). • assess risk (usually very small with small air receiver) . • control risk by: <ul style="list-style-type: none"> - having evidence of suitable design and fabrication eg. maker’s name or MDR and check it need to Register. - instructions, inspection and maintenance to suit vessels and staff – by persons judged by owner to be competent. - keeping brief record – eg. see AS 3873 Appendix J. 	Competency 1.4 See also Answer 4

Question	Answers	AS/NZS 3788 or other
	<p>Conditions Above inspection and results comply with AS/NZS 3788: 2006 Date of next inspection assumes no significant change in vessel operation.</p> <p>Signed _____ for Inspection body.</p>	
2.	<ul style="list-style-type: none"> • Sudden pitting suggests major change in operation or conditions. • Need immediate correction as 1mm loss/year is very significant [especially on small thin-walled boilers and tubes]. • Could be due – <ul style="list-style-type: none"> a) to leaking valves or rain [if <u>external</u> corrosion]. Then fix leaks and paint. b) loss of feed water control, condensate, oxygen, chemicals [if internal corrosion of shell or tubes]. Correct changes. c) may be others. Investigate further if needed. • Record briefly and advise client as above. 	5.3.6 M2.2

ANSWERS TO PAPER E

Exercise	Answers	AS/NZS 3788 or other
1	<p>[Only one specimen is reported here]</p> <p>(a)</p> <div style="text-align: center;">  </div> <p>(a) UT Thickness Gauge XYZ Model B4, size Calibrated on job for carbon steel. Acoustic velocity 5xxx</p> <p>Specimen: Sample 4, Flat Plate MS. Surface OK. Couplant: Clear grease. Initial Scanning: 10mm intervals in line 10mm apart. Local scanning at thickness change: sliding and 90⁰ rotation.</p> <p>(b) Local pitting or blind hole at position X</p> <ul style="list-style-type: none"> • Could be local corrosion – more like a drilled hole during fabrication (may be plugged on other end). • Recommend check for possible cause. Use UT to determine; or remove refractory for VT Monitor. <p>d) Recalibrate gauge to suit acoustic velocity of aluminum alloy [or measure thickness by caliper etc]..</p>	
2.	<ul style="list-style-type: none"> • Give rough sketch of vessel with approx. main dimensions [not given here]. • Data Plate details [Copy details] • PRV checked OK. PG OK. • Mild steel approx. 6mm shell and heads. • Stop valve appears OK. • Crack at position X: corrosion at Y: Dent at Z [locate on sketch.] 	<p>PRV = Pressure Relief Valves PG= Pressure Gauge</p>
3-10	Not given here – see AS/NZS 3788	

ANSWER TO PAPER C

Question	Answers	AS/NZS 3788 or other
1	<p>A. As the remaining thickness is equal to the design thickness, the thinning can be accepted. No need to re-rate design pressure [except if very significant sudden loss from actual to design thickness and CA is small].</p> <p>B $L_a = 50$</p>  <p>$t_1 = \frac{pD}{2f} = \frac{2 \times 1500}{2 \times 100} = 15\text{mm}$</p> <p>$t_2 = \frac{pD}{4f} = \frac{2 \times 1500}{4 \times 100} = 7.5\text{mm}$</p> <p>$L_s = 0.55 [Dt_1]^{1/2}$ $= 0.55 [1500 \times 15]^{1/2} = 82.5\text{mm}$</p> <p>Conditions: $L_a < 5 L_s$, $L_n < 5 L_s$, and $L_n < 2D/3$ } } Are satisfied.</p> <p>$\frac{t_m}{t} = \frac{19.5}{15} > 1$, and $\frac{L}{L_s} = \frac{50}{82.5} = 0.6$</p> <p>The intersecting point in fig N2 is above the heavy line. Thus thin patch is acceptable.</p> <p>Check with N4 shows vessel acceptable as t_{m12} is say 12mm.</p> <p>C If $t_m = 10$, then $\frac{t_m}{t} = \frac{10}{15} = 0.67$ $\frac{L}{L_s} = 0.6$ [no change from previous]</p> <p>From fig N2 this new intersecting point is below the heavy line and thinning patch is unacceptable.</p> <p>L/L_s value cannot change. Hence to re-rate the equipment $\frac{t_m}{t}$ has to be modified.</p> <p>Using fig N2 at $L/L_s = 0.6$, then $\frac{t_m}{t}$ should be 0.78 or above to be over the heavy line and be acceptable.</p>	<p>N3.3 D = mean diameter</p> <p>N3.4</p> <p>N3.2</p> <p>N3.6 P117</p>

ANSWER TO PAPER C

Question	Answers	AS/NZS 3788 or other
	<p>t_m is given as 10mm</p> $t = \frac{10}{0.78} = 12.82 \text{ mm}$ $t = \frac{pD}{2f}$ $P = \frac{2ft}{D} = \frac{2 \times 100 \times 12.82}{1500}$ $= 1.709 \text{ MPa}$ <p>Check with N4 shows vessel is acceptable if static.</p> <p>[Note the re-rating pressure may vary if applicant uses $\frac{t_m}{t} > 0.78$ but that will be conservative and acceptable.</p>	

ANSWER TO PAPER D

Question	Answers	AS/NZS 3788 or other
1a	<p>[Note: These terms are used differently by different persons but the intent for AICIP is below.]</p> <p><u>Risk Management</u> (B1) Overall management of risk to “optimise safety, efficiency and profitability”. It includes hazard identification, risk assessment, risk control and continued monitoring.</p> <p><u>Risk assessment</u> (B2.6) “quantification of total risk [i.e. likelihood of failure and consequence to life, property, environment & production] and is a combination of previous studies and analyses, which depend on equipment inspection procedures and incident reporting”.</p> <p><u>Quality Assurance</u> – the management system documented or not, which provides evidence and confidence that the quality of operations should provide products or services fit for purpose and to specification.</p> <p>Risk Management is focussed on overall management of risk in a business while <u>quality assurance</u> addresses overall management to provide a <u>quality</u> product [or service]. They are related and are essential parts of a “total management system”.</p> <p>Risk Assessment is an important <u>part</u> of the overall process of management of risk.</p> <p>All play a role in the overall control of pressure equipment to comply with the National Standard for Plant and most regulations.</p>	<p>1.5 & Append. B1 also AS 3873 & AS/NZS 4360</p> <p>B 2.6</p> <p>AS/NZS-ISO 9000 series & AS 3920.1</p>

ANSWERS TO PAPER F

Question	Answers	AS/NZS 3788 or other
1	<p>In NSW. OHS Act 2000 and OHS Regulation 2001 apply generally. Additionally Mines Inspection Act/Regulation and Dangerous Goods Act/Regulation/ACDG Code</p> <p>Throughout Australia, Inspectors also must comply with Trade Practice Act and civil and criminal laws.</p> <p>[For other States and Territories, other Acts and Regulations apply. Note: The National Standard for Plant is not law but has been adopted generally (with some exceptions) into Commonwealth, State and Territory law].</p>	1.1
2	<p>a) Cause: Failure of carbon steel HT heater due to multiple cracking – GM states due to manufacturer of heater – CE reports no upsets before failure</p> <p>b) Effects: Are they biased? Possibly! Checked for other evidence. Found lost temperature recording showing gross overheating the day before leak.</p> <p>[Lesson: Not all information is right but it must be consistent with facts people make errors]</p>	3.3.2 and 7.1
3	<p>a) Cause: Steam condenses in vertical pipe to Boiler No 1 and intermittently runs down one side of the pipe until it reaches the high temperature area. Cyclic quenching induces thermal fatigue cycles about every minute.</p> <p>b) Modify operation to keep both boilers working or add a stop valve below X</p>	7.1 and M5
4	<p>a) Stress corrosion cracking (warm contents with agent which promotes SCC eg m.m.amine)</p> <p>b) Sample UT or RT in areas of high stress or residual stress near weld toes</p> <p>c) Modify the contents and/or temperature; PWHT welds or cold bent pipe; avoid very high piping stresses.</p>	7.1 and M2.7

COMPETENCIES FOR IN-SERVICE INSPECTORS OF PRESSURE EQUIPMENT (Note 1- Page 5)

No	COMPETENCY (See Note 2b of page 5 for Terms)	Inspector (Note 2)	Senior Inspector (Note 2)	AS/NZ 3788 Reference (Note 3)
1. PLANNING AND PREPARING FOR INSPECTION				
1.1	Understand the objectives of Inspection.	√	√	2.1 & Fig. 1.1
1.2	Understand the elements of Inspection.	√	√	2.2
1.3	Understand the stages of Inspection.	√	√	2.3
1.4	Select, interpret and apply relevant information from specific Standards or Regulations.	√	√	1.1 & 1.3
1.5	Understand the inspector's responsibilities to customer, employer and law with regard to inspection, and vice versa.	√	√	3.1, 3.2 & 5.1.2
1.6	Understand and apply the agreed Code of Ethics.	√	√	AICIP 005Rev1
1.7	Respond appropriately to unexpected situations in field of responsibility (Note 4).	√	√	eg. 1.8
1.8	Have the appropriate physical and mental capabilities required by the employer eg. working in confined spaces, heights, depths etc. (Note 4).	√	√	3.2.1 (b)
1.9	Have eyesight to permit reading reports and performing visual inspection.	√	√	3.2.1 (b)
1.10	Understand, interpret and apply customer and contractual requirements – particularly scope of work.	√	√	1.2
1.11	Communicate effectively with customer and other relevant bodies.	√	√	2.4 & 2.2 (e)
1.12	Check whether changes, repairs, alterations, malfunctions or incidents have occurred on the equipment since the previous inspection.	√	√	6
1.13	Develop an appropriate inspection and test plan (ITP). See also items 1.14 and 1.15).	√	√	2.4 & 4.4
1.14	Specify where and when inspection and testing is required to identify potential flaws, features or properties.	√	√	Table 4.1 & referenced sections
1.15	Select the inspection and test method for particular inspection with any special requirements.	√	√	Appendix D
1.16	Select and check inspection documents and equipment.	√	√	3.2.1(a) & App.C3
1.17	Understand risk assessment principles and main features.	√	√	1.5
1.18	Determine the equipment hazard level from AS 4343 (eg. for registration and notification purposes).	√	√	3.3,6.1,6.2,8.1,8.3, AS/NZS 4343 Appendix B
1.19	Understand quality assurance principles and main features.	√	√	Appendix V & AS/NZS 3920.1
1.20	Plan and perform an audit on inspection activities.	-	√	
1.21	Upgrade knowledge and skill as needed (Note 4).	√	√	1.8, 3.1(j) see item 1.6
2. CONDUCTING INSPECTION (to ITP in item 1.13)				
2.1	Ascertain authority to inspect and identify equipment.	√	√	2.4
2.2	Check conditions for safe access.	√	√	3.1(l) & App.C
2.3	Follow safe working procedures and practices according to OHS, Employer and Owner/User requirements.	√	√	Appendix C
2.4	Visual Inspection (including pit depth and corrosion assessment).			Appendix D6 & I7
	Draw up the Procedure.	-	-	
	Perform the procedure.	√	√	
	Record and report results.	√	√	8
	Verify, understand, assess results and recommend action.	√	√	

Main changes from Rev1 are shown with vertical line.

COMPETENCIES FOR IN-SERVICE INSPECTORS OF PRESSURE EQUIPMENT (Note 1)

2. CONDUCTING INSPECTION (to ITP in item 1.13).		Inspector (Note 2)	Senior Inspector (Note 2)	AS/NZS 3788 Reference (Note 3)
2.5	Materials Identification (Visual, Spectrograph, etc)			Appendix D14.1
	Draw up the procedure (Visual)	-	-	
	Perform the procedure (Visual)	√	√	
	Record and report results (Visual)	√	√	
	Verify, understand, assess results and recommend action.	√	√	
2.6	Digital thickness testing - Ultrasonic			Appendix D7 & I7
	Draw up the procedure	-	-	
	Draw up the procedure	√	√	
	Record and report results	√	√	
	Verify, interpret, assess results and recommend action	√	√	
2.7	Penetrant Testing			Appendix. D11
	Draw up the procedure	-	-	
	Perform the procedure	-	-	
	Record and report results	-	-	
	Verify, understand, assess results and recommend action	√	√	
2.8	Magnetic Particle Testing (Basic Features)			App.D10 & I7
	Draw up the procedure	-	-	
	Perform the procedure	-	-	
	Record and report results	-	-	
	Verify, understand, assess results and recommend action	√	√	
2.9	Radiography (Basic Features)			Appendix D8
	Draw up the procedure	-	-	
	Record and report results	-	-	
	Verify radiographs and report comply with specified requirements (Interpretation is not a requirement)	√	√	
	Verify, understand, assess results and recommend action	√	√	
2.10	Ultrasonic Testing (Basic Features)			Appendix D9
	Draw up the procedure	-	-	
	Perform the procedure	-	-	
	Record and report results	-	-	
	Verify, understand, assess results and recommend action	√	√	
2.11	Eddy Current Testing (Basis Features)			Appendix D13
	Draw up the procedure	-	-	
	Perform the procedure	-	-	
	Record and report results	-	-	
	Verify, understand, assess results and recommend action	-	√	
2.12	Thermographic Inspection (Basic Features)			Appendix D12
	Draw up the procedure	-	-	
	Perform the procedure	-	-	
	Record and report results	-	-	
	Verify, understand, assess results and recommend action		√	
2.13	Metallurgical Tests (Including Microscopy, Replication)			Appendix D14
	Draw up the Procedure	-	-	
	Perform the procedure	-	-	
	Record and report results	-	-	
	Verify, understand, assess results and recommend action.	-	√	

COMPETENCIES FOR IN-SERVICE INSPECTORS OF PRESSURE EQUIPMENT

2. CONDUCTING INSPECTION (to ITP in item 1.13).		Inspector (Note 2)	Senior Inspector (Note 2)	AS/NZS 3788 Reference (Note 3)
2.14	Material Hardness Testing			Appendix D14.2
	Draw up the procedure	-	-	
	Perform the procedure	-	-	
	Record and report results	-	-	
	Verify, understand, assess results and recommend action.	√	√	
2.15	Mechanical Tests i.e. Tensile, Bend, Charpy			
	Draw up the procedure	-	-	
	Draw up the procedure	-	-	
	Record and report results	-	-	
	Verify, interpret, assess results and recommend action	√	√	
2.16	Remote Visual Examination, Intrasopes, Mirrors, Fibre Optics Methods or Portable Television Cameras			Appendix I7
	Draw up the procedure	-	-	
	Perform the procedure - mirror only	√	√	
	Record and report results	-	-	
	Verify, understand, assess results and recommend action	√	√	
2.17	Hydrostatic Pressure Testing			Appendix D15
	Draw up the procedure	-	√	Appendix D15.5
	Perform the procedure	√	√	
	Record and report results	√	√	8
	Verify, understand, assess results and recommend action	√	√	
2.18	Pneumatic Pressure Testing			Appendix D16
	Draw up the procedure	-	√	Appendix D16.6
	Perform the procedure	√	√	
	Record and report results	√	√	8
	Verify, understand, assess results and recommend action	√	√	
	Verify, understand, assess results and recommend action	√	√	
2.19	Soapy Water Leak Test			Appendix D18
	Draw up the procedure	√	√	
	Perform the procedure	√	√	
	Record and report results	√	√	8
	Verify, understand, assess results and recommend action	√	√	
2.20	Understand and interpret Pressure Equipment drawings including process and piping and instrumentation diagrams	√	√	
2.21	Identify Hazards related to the Pressure Equipment	√	√	Appendix. B
2.22	Carry out basic Risk Assessment and make recommendations to the Owner/User. Understand Risk Based Inspection.	-	√	Appendix. B 1.5
2.23	Perform Basic Design Calculations to determine			5 & 6
	a) Minimum required thickness, (including determination of calculation pressure, design temperature and design strength)	-	√	eg. AS1210, AS 4041 or AS1288
	b) Acceptability of equipment condition	-	√	
	c) Remaining corrosion life	-	√	5.3.6
	d) Re-rating of working pressure of temperature	-	√	5.4 & 6.3
2.24	Advice on Repairs, Replacement and Alterations			6.1 & 6.2
	a) Recommend Where, When and Why these are required.	√	√	
	b) Recommend method or methods of extending life (including coatings, linings or change of conditions).		√	
	c) Assess the reported results and recommend action.		√	

COMPETENCIES FOR IN-SERVICE INSPECTORS OF PRESSURE EQUIPMENT

2. CONDUCTING INSPECTION (to ITP in item 1.13).		Inspector (Note 2)	Senior Inspector (Note 2)	AS/NZS 3788 Reference (Note 3)
2.25	Advise on Re-rating a) Recommend When and why this is required. b) Provide basis and any conditions for recommended re-rating.	- -	√ √	6.1 & 6.3
2.26	Carry out the inspection required on equipment at the Installation or Commissioning stage to ensure compliance with AS/NZS 3788 ie. no damage, correct accessible name plates, stamping, supports, earthing, protective devices and any required site leak testing.	√	√	4.2
2.27	Carry out on-stream inspection and tests on equipment (in operation) to detect any malfunction needing inspection.	√	√	4.3
2.28	Carry out the Periodic Internal and External Inspection in accordance with AS/NZS 3788.	√	√	4.4
2.29	Perform final inspection and tests on changes, repairs, alterations and replacements.	√	√	6
2.30	Investigate Deterioration and Failures a) Obtain and document data for analysis b) Identify modes and causes of deterioration and failures c) Determine acceptability or remaining life d) Recommend action	√	√ √ √	7 Sect 5, 7.2.2 I3, Appendix. M Append. N,O,U 7.3
2.31	Apply the above competencies to each specific type of Pressure Equipment listed below:			
	a) Boilers – Fire Tube, Water Tube, Electric - Locomotive and similar			Appendix F Appendix Y
	b) Unfired Pressure Vessels - Stationary, process and air receivers - Cryogenic - Buried and mounded			Appendix. G 4.11 Appendix. R
	c) Transportable Pressure Vessels			Appendix. E
	d) Transportable Drums for Liquefied Gas			Appendix. W
	e) Deaerators			Appendix. S
	f) Heat Exchangers, Coolers, Condensers			Appendix. H
	g) Fire Heaters (including Hot Water Heaters)			Appendix. J
	h) Pressure Piping			Appendix. I
	i) Vessels with Quick-Actuating Closures & Swing Bolt doors			Appendix. Q
	j) Idle Pressure Equipment			Appendix L & 4.5
	k) Storage Tanks to ANSI/API 620 or equivalent			Appendix T
	l) Pressure Relief Devices			4.6, Appen. P&X
	m) Controls Critical for Safety	-	√	4.7, F5
3. REPORTING ON INSPECTION				Appendix Y
3.1	Record and report results	√	√	2.4, 8, 7.3 Appendix. K & P
3.2	Maintain registers, essential references and histories	√	√	8.2, 8.3, 8.4
3.3	Ensure secure, up-to-date, accessible filing for retrieval	√	√	8.1
3.4	Recommend future inspection, testing and surveillance programmes	-	√	2.4
4. TRAINING AND SUPERVISION				
4.1	Train inspection staff	-	√	3.1(j)
4.2	Instruct, supervise staff and review their performance	-	√	3.1(j)

NOTES

1. For Boilers, Pressure Vessels and Pressure Piping with inspection to AS/NZS 3788 Pressure Equipment – In-Service Inspection.
2. Competencies are given for two levels of inspection ie. “Inspector” and “Senior Inspector”. For “Inspector” level there are three main elements of competency (1, 2, 3 in above Table) and four for “Senior Inspectors” (1, 2, 3 & 4) with each element having a number of detailed competencies. These are expressed in a manner to align with:
 - a) “performance criteria” in AS/NZ 4481 by indicating the level of quality of work performance required; and also
 - b) the “evidence guide” by indicating the form of examination eg. “understand” means the examination will be based largely on written or oral knowledge and the skill to communicate this; while “demonstrate”, “report” or “perform” means assessment will be based on performance eg. of visual inspection, thickness measurement, developing an inspection plan or final report; and “verify” is intended to mean that the inspector is assured that the reports, tests, etc. are correct eg. by authorised bodies, persons and not necessarily by repeating or witnessing the tests.
3. These references refers to AS/NZS 3788: 2006 clause or appendix, unless otherwise noted. Other references maybe required to provide additional guidance.
4. This competency may only be partially assessed by AICIP.
5. The given competencies are expressed as realistic workplace outcomes and may be used as an approximate guide for a training syllabus by training bodies or self study by students.
6. Final examination or assessment of these competencies will be made by impartial, competent, trained assessors on the AICIP’s Panel of Examiners.

Main Referenced Standards

AS/NZ 3788	Pressure Equipment
AS/NZ 3920.1	Assurance of Product Quality – Pressure Equipment Manufacture
AS/NZ 4041	Pressure Piping
AS/NZ 4343	Pressure Equipment – Hazard Levels

ADVICE FOR CANDIDATES FOR AICIP 2008 EXAMINATIONS

ALL CANDIDATES

For the 2006 examinations, AS/NZS 3788-2001 or - 2006 could be used as the basis of answers. In 2007, preference was given to the 2006 edition, and in 2008, the 2006 edition should be used.

Note: The 2006 edition corrected some errors and added more data.

SISI CANDIDATES

The following outlines the syllabus of training adopted by TAFESA Panorama Campus together with comments from AICIP to help both training and examinations (papers C and D).

Overall:

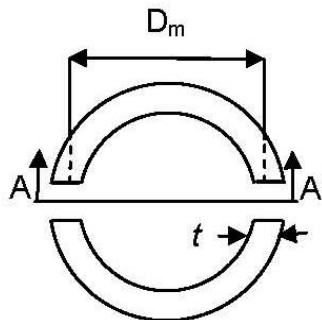
The topics proposed below by TAFESA look good and cover most matters needed by senior inspectors and the exams, and should be within grasp of most candidates for papers C and D.

1. Basic algebra, evaluation transposition, basic rules (Formula: AS 1210, AS 1228, AS/NZS 3788 and AS 4041)

- .1 Paper C (calculations) is for senior inspectors and aims to check their ability to assess situations numerically – i.e. by calculations. Hence, we use examples from industry which are not uncommon, may be encountered by SISI and which involves calculation logic (and usually simply calculations). These cover essential principles also.
- .2 For this first topic understanding the basis of some of the equations in the referenced standards is a good idea. The main one which will help them appreciate the various equations for Paper C is:

For cylinders: $f = \frac{p \times D_m}{2t\eta} = \frac{p(D_o - t)}{2t\eta} = \frac{p(D_i + t)}{2t\eta}$ where η is weld joint efficiency.

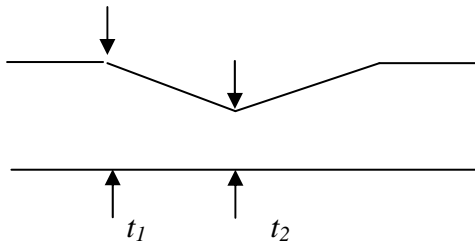
When the simple mechanics of using the two halves of cylinder is presented, the above is made clear and candidates can understand the various equations given in the standards. See Figure 1.



Force pushing up on Section A-A
 = $p \times D_m$ for Unit length of cylinder:
 Equal Force restraining top half
 = 2 x force in one wall
 = 2 x stress x t
 $\therefore p D_m = 2 \times f \times t$, or $f = \frac{pD_m}{2t}$

FIGURE 1. CYLINDER

.3 Another simple calculation is the determination of the mean thickness of a shallow vee-shaped loss of thickness. Candidates spend a lot of time calculating this. See Figure 2.



$$\text{Mean thickness over wasted area} = \frac{t_1 + t_2}{2}$$

FIGURE 2. Local wastage

.4 Another basic formula is the relation between stress, strain and Young's modulus. *i.e.* $\frac{\text{Stress}}{\text{Strain}} = E$

.5 Examples of typical questions used in Paper C are:

- i) Acceptability of a crack like defect (sharp gouge, lack of fusion or crack) – using Appendix O. Here, the main traps are selecting the appropriate Figure O2, determining σ and if any residual stress should be added, and what is a e.g. crack length, depth, $\frac{1}{2}$ depth or $\frac{1}{2}$ length as shown in Figure O2 and its units (metres).
- ii) Acceptability of local corrosion using Appendix N and examples.
- iii) Selection of flange ratings for material, Pressure and Temperature.
- iv) Calculation of required thickness of a cylindrical component with correction for allowances (tolerance, manufacturing and corrosion).
- v) Life estimation of a vessel or component subject to fatigue or creep. ISI are assessed for corrosion life.
- vi) Other calculations relevant to SISI (not yet determined).

2. Risk Management of Pressure equipment (AS/NZS 3788 Appendix "B"), (AS 1210 Appendix "C"), AS/NZS 4260, AS/NZS 3931, (AS 3873 Appendix "D"). Risk based Inspection of Pressure equipment. Risk assessment (practical examples).

Here a basic but brief definition is handy keeping in mind that RM has been practiced for thousands of years and applies to any proposed action including crossing a road, investing in shares and planning a hazardous inspection. Last year in UK, an oil company was fined about \$2 million for deaths of two men and 3 breaches – one of which was inadequate RM to prevent over exposure to toxic gas during inspection of a repair of a leaking pipe on a rig.

The simple equation: $R = P_f \times C_f$ should be presented and explained. Here, R = risk; P_f = probability of Failure; C = consequence of failure.

Also explain what is a hazard and cause.

3. Quality Management Systems AS/NZS ISO 9001, AS/NZS ISO 3834, AS 3920.1 and AS 4343

This is also important but the main point is that QM should suit the owner and not be overdone. Everything does not need to be documented and checked. Its better to be underdone than overdone, and a few really good forms are the crux of the working system.

4. Conformity Assessment of Pressure equipment, AS/NZS 3788, AS 1210, AS 1200 and AS 3920.1

Conformity assessment (CA) is causing problems in the PE industry at the supply stage now that Regulatory Authorities have moved out of this area. The principles in AS 3920.1 apply also to post-construction activities but these are not identified as CA except possibly for major modifications and repairs. The amount of CA (inspection, testing and QM) should increase as the consequence of failure increases, in order to keep the Risk very low.

Note: Hazard levels in AS 4343 are a simple general measure of the consequence of failure based on the amount of damage increases with the increase of released energy, etc.

5. Managing Plant Legislation and Standards

Law and standards need to be kept up to date and complied with as soon as practical. A brief discussion would be worthwhile on when, why, how and the implications of varying from standards. This will include management of the inspection body's Risk i.e. not only the user's risk. Applicable regulations should be identified.

6. Pressure equipment design AS 1210, AS 4041 and AS 1228

PE design for SISIs need only address the really basic issues and main elements. SISIs are not required to be designers but should have a sound understanding for the exams and be competent in design if they undertake design or design verification work. We suggest this at least discusses design specification, cylindrical shells, dished ends, nozzles, supports, welded joints, and material selection.

Latest thinking is to design against each of the failure modes (damage mechanisms) which may be encountered in the expected credible service loads, actions and conditions. Currently the design stress (f) covers most of the stress-dependent failure modes.

7. Verification calculations of Pressure equipment

The main verification checks for inspectors are to ensure the design has been satisfactorily registered, appears OK, and tallies with the actual PE. This applies to new and especially to modifications or repairs which could impair PE safety.

8. Wall thinning of Pressure equipment (AS/NZS 3788 Appendix "N")

The exam will include a practical case where this appendix will be needed. See comment above in Topic 2 re mean thickness.

9. Assessment of Planar Defects calculations (AS/NZS 3788 Appendix "O")

The exam will also include a practical case where this appendix is needed. Points where errors occur include the use of wrong equations for surface and embedded flaws, the flaw size in mm, and no statement about the K_{ic} value used or about residual stress or allowance for any out of circularity.

10. Effective Remaining Life Assessment calculations (AS/NZS 3788 Appendix "U")

Remaining life is an important matter for SISIs and will be partly covered in the exam. Points to consider are:

- when do you do it and why
- the assumptions that are made
- the time dependent failure modes involved i.e. corrosion/erosion, creep, fatigue, and combinations (other modes will not be examined but candidates should be aware of them)

- the remaining safe life as distinct from the possible total life i.e. to failure
- wastage and cracking can lead to a critical flaw size which will result in failure by other modes
- it is reasonable to use actual or nominal thickness in calculations
- for creep or fatigue lives, the exams would give creep and fatigue curves for easy calculation. Calculation of crack propagation will not be required.
- for fatigue the stress range can be obtained from the hoop stress range based on [the average maximum (not design) stress minus the average minimum stress based on actual thickness] x [a suitable stress concentration factor e.g. 1.2 for a longitudinal weld, 2.5 to 5 for nozzle fillet weld or other value provided in standards or as determined by FEA].

For the exams any reasonable conservative value can be assumed if not provided.

11. Pressure equipment insurance (Legal commitment)

Insurance and liability are good points to address but need only be to a basic understanding. This needs to include PI insurance as well as coverage by the PE owner and the conflict of whose risk is most important – the inspector, the inspection body or the PE owner or operator.

Inspectors can also have the problem that a logical variation from a standard might be prevented by PI or other insurance. This area probably needs group discussion because there are many answers. Marking is difficult and mainly depends on the justification provided. Legal lecturers might give good ideas. In practice inspectors will ultimately rely on legal advice if problems arise. Ideas from the class could be a good way of education.

12. Inspector Training - AS/NZS 4481/SA, NZSMP76, AS/NZ 3788

Brief data should be presented on the selection, induction, training, supervision, instruction, informing, upgrading, reporting and appraisal of inspectors.

13. Re-rating

This is now more extensively addressed in the new 3788 and at least 30 minutes of lecture time should be given to this to make candidates aware of the new material and some main principles or factors. The exam could have a question but will not expect more than some main points as covered by 3788.

These ideas are general only and the examination papers may have variations and additions.

S. Ambrose for AICIP
for C. Smallbone, AICIP Secretary