

ONRSR Guideline

Rail Locomotive Boilers



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1 Purpose

The purpose of this guideline is to provide rail transport operators with guidance on ONRSR's expectations for demonstrating the safety of rail locomotive boilers. It also includes some guidance on the operation of reciprocating steam engines.

2 Background

Locomotive boilers are pressure vessels used to power steam locomotives. They pose a specific high risk, as a boiler failure caused by incorrect maintenance or operation can lead to catastrophic consequences. A defect in a locomotive boiler (or its fittings) that allows an escape of steam can cause severe scalding or even the death of anyone in close proximity.

Under the *Rail Safety National Law* (RSNL) rail transport operators are required to ensure the safety of locomotive boilers as part of their Safety Management System (SMS), so far as is reasonably practicable (SFAIRP). A key part of an effective SMS is ensuring that workers are competent to operate, maintain, repair and inspect in a way which ensures their safety and the safety of the public. The rail transport operator is responsible for authorising operations and any work undertaken on the boiler.

There may be other requirements under Work, Health and Safety legislation that rail transport operators must also meet. These can form part of the way that operators demonstrate compliance with the RSNL also. This guideline provides further information.

3 Scope

This guideline is intended for use by all rail transport operators who operate and manage a rail locomotive boiler. It is also useful information for persons such as independent boiler inspectors or boiler repairers, who may be asked to perform work on a steam locomotive boiler.

It is not intended to provide comprehensive guidance on the maintenance and operation of steam locomotive boilers, rather guidance on the evidence that ONRSR requires for demonstrating compliance with the RSNL. For more detailed industry best practice, rail transport operators should refer to the RISSB Code of Practice for *Inspection maintenance and repair of rail locomotive boilers* (referred to as "the RISSB Code of Practice"), and Australian Standards. A list of resources, including related Australian Standards, is provided in [Appendix A](#). Note that ONRSR does not set or approve industry standards but encourages rail transport operators to follow these unless they can demonstrate an equal or better level of safety can be achieved another way.

Record keeping is important for demonstrating that the locomotive boiler is being managed in a way that ensures safety, and is compliant with the RSNL. It is also important for ensuring the integrity of the boiler as people who work for a rail transport operator change over time.

Indicates guidance on the type of records that ONRSR would expect is shown in each section.

4 Definitions

Definitions provided by the *Rail Safety National Law* (RSNL) and the National Regulations apply within this guideline.

- > **RSNL** – means the *Rail Safety National Law* which has been enacted as a Schedule to the *Rail Safety National Law (South Australia) Act 2012* (SA) as it applies in each state and territory. In Western Australia, RSNL means the law which has been enacted as mirror legislation in the *Rail Safety National Law (WA) Act 2015*.
- > **National Regulations** – means the Rail Safety National Law National Regulations 2012; or the Rail Safety National Law (WA) Regulations 2015 in Western Australia.

- > **Rail locomotive boiler** – includes heritage boilers (defined by AS3788 - Appendix Y) and any other boiler used in a rail locomotive.
- > **RISSB** – means the Rail Industry Safety and Standards Board.

Where terms are not defined within the legislation the *Macquarie Dictionary* definition applies.

Use of the word 'should' indicates a recommendation of ONRSR, however, the rail transport operator is free to follow a different course of action provided that it complies with the legislation. Use of the word 'must' indicates a legal requirement where compliance is necessary.

5 Relevant legislation

A key requirement of accreditation is that rail transport operators implement and comply with an SMS, which ensures the safety of their railway operations so far as is reasonably practicable. Section 99 of the RSNL and Schedule 1 of the National Regulations outline the required contents, which includes the requirement to ensure risks and assets are managed appropriately.

Section 117 of the RSNL imposes obligations on rail transport operators to ensure that each rail safety worker who is to carry out rail safety work in relation to the operator's railway operations (being those for which the rail transport operator is required to be accredited) has the competence to carry out that work safely. There are also related safety duties in section 52. The SMS should also ensure that competent workers also have the capacity/ authority to exercise their competencies as required by the SMS.

Further information on competency requirements is available in ONRSR's Application of the AQF to Rail Safety Worker Competence Assessment Policy.

Work, Health and Safety legislation (WHS) applies in addition to the RSNL. Under section 48 of the RSNL, if there is an inconsistency between the RSNL and the WHS legislation, then the WHS legislation will prevail over the RSNL to the extent of any inconsistency.

6 Operation of rail locomotive boilers and reciprocating steam engines

A person must meet the requirements of section 117 of the RSNL to show that they are competent to operate the specific locomotive boiler or reciprocating steam engine they are working on. It is the responsibility of the rail transport operator to demonstrate this to ONRSR.

Typically this means that the worker must hold relevant *qualifications* or *units of competence* under the Australian Qualifications Framework (AQF), unless this is not reasonably practicable - in which case they must demonstrate competence through other means.

For the operation of locomotive boilers the AQF *qualifications* that have been used are:

- > MSMBLIC001 Licence to operate a standard boiler
- > MSMBLIC002 Licence to operate an advanced boiler
- > UEPOPL002A Licence to operate a reciprocating steam engine

Under Work, Health and Safety legislation workers may have to hold a High Risk Work Licence (HRWL), which requires completion of these courses (as relevant to each licence) with an additional assessment.

These courses, and the HRWL, currently only cover a part of what is required to demonstrate to ONRSR that these items can be safely operated on a rail locomotive. They are focussed on modern, stationary boilers which means, for example, that training and assessment on minimising the risk of variable water levels (as the train moves up and down) is not typically included— an important element of ensuring the safety of a locomotive boiler.

Unless it can be demonstrated that the training and assessment specifically addressed the type of locomotive boiler the worker operates, the attainment of these qualifications alone or a HRWL cannot demonstrate competency to operate the rail locomotive boiler safely under the RSNL. This means that for many rail transport operators it is unlikely to be reasonably practicable to use these qualifications for training new workers, however they should still evaluate this as part of their task and risk assessment (see ONRSR's Application of the AQF to Rail Safety Worker Competence Assessment Policy).

An AQF *unit of competence* is more task specific than a qualification and may form part of the assessment of competence. These should also be assessed when determining if use of the AQF is reasonably practicable. In particular there are several units of competence directly relevant to the operation, maintenance and inspection of rail locomotive boilers, including:

- > TLIC3030 Operate & monitor a heritage steam locomotive (relevant for the driver or fireman)
- > TLIC3031 Stable a heritage steam locomotive (relevant for operating the boiler and maintenance)
- > TLIB3124 Apply awareness of steam locomotive fundamentals (relevant for operating the boiler, maintenance, repair and inspection)
- > TLIB4077 Inspect & prepare a heritage steam locomotive (relevant for operating the boiler, maintenance and inspection)
- > TLIF4110 Respond to emergencies & abnormal situations (may be relevant for the driver or firemen)

(Note that operating the boiler may be a specific role in the organisation or it may be the role of the driver or fireman).

Where a rail transport operator proposes not to use relevant AQF qualifications or units of competency they should document why it is not reasonably practicable to do so, and also outline their alternative approach to ensuring their boiler operators have the competence to operate the boiler safely.

Over time qualifications and units of competence available under the AQF may change (and be updated) and rail transport operators should keep up to date with available training, through the AQF and also through industry associations. The Association of Tourist and Heritage Rail Australia (ATHRA) offers training and assessment packages for Firemen and Steam Locomotive Drivers, which are specific to operating locomotive boilers and reciprocating steam engines.

Note that ONRSR does not approve any training or assessment. Our role is to ensure that the rail transport operator can demonstrate that rail safety workers have been assessed as competent as per section 117.

- Records that the rail transport operator has assessed the competence of the rail safety worker in accordance with any applicable AQF qualification and units of competence, and made a determination on whether attainment is reasonably practicable
- Certificates of attainment in AQF units of competence as relevant

6.1 Evidence of competence

For persons operating rail locomotive boilers or reciprocating steam engines, competence should be demonstrated through a combination of means – including qualifications, other training and assessment (such as that via ATHRA), in-house instruction, and experience. The rail transport operator must be able to provide ONRSR with:

- > The detailed task and risk assessment of the worker's role

- > A description of the skills and qualifications necessary for the role/task
- > Details of how the person is assessed to have these skills and qualifications (i.e. that they are competent)

This should be part of the 'Competency Statement' (see ONRSR's Application of the AQF to Rail Safety Worker Competence Assessment Policy for details of what this should include), with supporting processes set out in the SMS. The suggested evidence is only part of ensuring that rail transport operators have met their safety requirements under the RSNL.

Examples of evidence of competence to operate a rail locomotive boiler / reciprocating steam engine may include:

- > Records that the person has completed the ATHRA Fireman (boiler) training and assessment package / Driver (reciprocating steam engine) training and assessment as adapted to their organisation and certified by an ATHRA appointed assessor (who should hold a Certificate IV in Training and Assessment)
- > Certificate of attainment for relevant qualifications or units of competence under the AQF, combined with additional skills, training, qualifications as necessary
- > Boiler standard or advanced HRWL / Reciprocating Steam Engine (ES) Licence (the licence may be current or expired), combined with additional skills, training, qualifications as necessary
- > Certificate of competency from the boiler standard or advanced AQF courses / Licence to operate a reciprocating steam engine, combined with additional skills, training, qualifications as necessary

Other skills, training, qualifications to operate on a rail locomotive may include, for example:

- > A combination of other qualifications, such as, operating pressure equipment, driving a rail locomotive (welding, maintenance, inspection qualifications can evidence a worker's experience although they are not directly necessary for operating a boiler)
- > ATHRA Fireman (boiler) (locomotive boiler) training and assessment package / Driver (reciprocating steam engine) training and assessment
- > Non-AQF or in-house developed training (delivered and assessed following ONRSR's Application of the AQF to Rail Safety Worker Competence Assessment Policy)
- > Recognition of prior experience and skills operating the boiler (or a similar boiler), and within rail, such as driving a steam locomotive or operating a reciprocating steam engine

For each worker there should be an additional record of training/ instruction to operate the specific boiler or reciprocating steam engine being used by the rail transport operator. This would include training the worker on any risks specific to the workplace and with the boiler. It may look like an induction sheet that has been signed off by a competent person, supported by a procedure to ensure an induction is provided to each new worker.

A worker may have undergone training many years ago or gained skills through experience and records may not be available. In these cases, the rail transport operator must still demonstrate that the worker has the necessary qualifications and competencies; and the knowledge and skills to carry out the work safely. This could be through relevant training, prior experience, length of service, records of safe operation, assessments undertaken, and/or other related qualifications. Again it must be shown that the worker has the competencies that the rail transport operator has determined are necessary to operate the boiler safely.

A means of routinely assessing a worker's competence, to satisfy the rail transport operator and ONRSR that they continue to use safe practices, should be part of the SMS.

Training / mentoring in operating the boiler / reciprocating steam engine must be undertaken by a competent person. Ideally assessment would be undertaken by an external source (e.g. registered training organisation) but at a minimum the assessor must not be the same person that delivered the training / mentoring. The assessor should hold, as a minimum, a Certificate IV in Training and Assessment and be familiar with the work to be undertaken by the worker.

Records relating to competence must be kept by the rail transport operator as per regulation 30 of the National Regulations.

- Competency Statement, including risk assessment and task analysis (as per ONRSR's Application of the AQF to Rail Safety Worker Competence Assessment Policy)
- Evidence of training and competency assessment, including on the specific boiler / reciprocating steam engine (evidence may include relevant certificates of attainment)
- Training was undertaken by a competent person and assessment has been undertaken independently by a Certified Trainer and Assessor

6.2 Documented instructions

This section is applicable to the operation and maintenance of boilers which may be undertaken by a boiler operator or other roles.

A rail transport operator should provide to its workers (and ONRSR on request) documented instructions in relation to safe locomotive boiler operation. These instructions should be consistent with the requirements of AS3873 (sections 3 and 4), as relevant to the boiler. Systems and procedures developed by the rail transport operator for the operation, maintenance and operational inspections of a locomotive boiler should cover, amongst other things, the following minimum instructions:

- > Pre-start checks
- > Start-up procedure
- > Start-up checks
- > Operational procedures (for example):
 - injector use and maintaining the correct water level
 - blower use
 - correct firing methods
 - blow down
 - cleaning the fire
 - lifting of safety valves (at the set pressure)
- > Water treatment procedures
- > Shut down procedures, including procedures for banking a fire
- > Shut down checks
- > Emergency procedures – i.e. how to respond to a developing boiler emergency – for example, what to do in the event of a failed tube, broken gauge glass, failed fusible plug, cracked/leaking barrel, leaking wall or crown stays, buckled crown sheet etc.

Operating a boiler may also include conducting washouts, managing water treatment, preparing the boiler for independent inspection, and operating the locomotive (with restrictions, such as low speed and within a facility).

- Workers operating, maintaining or inspecting boilers / reciprocating steam engines have documented instructions

6.3 Emergency procedures

Under some circumstances, what would normally be a minor failure or fault with a boiler can rapidly become a serious incident should the correct response not be followed.

The rail transport operator's SMS must incorporate emergency procedures and workers operating boilers must receive training in these procedures, as well as documented instructions. These should cover emergency boiler shutdown procedures.

The training should include procedures for an emergency boiler shutdown, including how to identify when an emergency boiler shutdown is required.

ONRSR would expect to see these procedures linked to the Emergency Management Plan as per regulations 19 and 20 of the National Regulations.

- Emergency procedures, including boiler shutdown
- Evidence that workers operating boilers have been trained
- Emergency Management Plan

7 Maintenance, repairs and alterations of rail locomotive boilers

7.1 Evidence of competence

The maintenance, repair and alteration of rail locomotive boilers is rail safety work and persons undertaking these tasks must have the skills and qualifications necessary to ensure the safety of the boiler. What is required depends on the task, and might include working skills and knowledge, trade and/ or professional engineering qualifications.

As per section 6 the rail transport operator is responsible for ensuring workers that are maintaining, repairing or altering the rail locomotive boiler are competent and can demonstrate this to ONRSR. This may include relevant trade certificates (for example, mechanical fitting, boiler making, welding) and will most often be evidenced by extensive work experience (in riveting and caulking, for example). Some relevant units of competence under the AQF are listed in section 6. If a worker is required to operate the boiler they must also be able to demonstrate competency for this task as per section 6.1.

As the Original Equipment Manufacturer instructions (OEM) are often no longer available, it is recommended that rail transport operators refer to the RISSB Boiler Code of Practice (section 3) and relevant Australian Standards. Specific documentation may need to be developed with a competent person.

Maintenance is generally undertaken by workers competent in the specific task, who may have supporting trade qualifications or equivalent knowledge and experience. Maintenance may involve routine 'like for like' replacements within the design of the boiler.

As a general principle, repairs and alterations should be inspected by a competent person who is not involved in the work. This is not always an independent inspector. An example of a repair that may be inspected by a competent person is the replacement of fire or flue tubes, which may damage the tubeplates.

Repairs and alterations that vary the original construction pose a greater risk to the integrity of the boiler, particularly where different materials/ methods are planned or the design will be altered.

These should be verified by a competent independent inspector (e.g. with a supporting engineering qualification). A supporting change management process and documentation should be in place.

- Competency Statement, including risk assessment and task analysis (as per ONRSR's Application of the AQF to Rail Safety Worker Competence Assessment Policy)
- Evidence of training, recognition of skills/experience, and competency assessment, including on the specific boiler / reciprocating steam engine
- Training was undertaken by competent persons and assessment has been undertaken independently by a Certified Trainer and Assessor

7.2 Maintenance records

A boiler history file containing full and thorough records should be maintained for every steam locomotive boiler. The boiler history file should include registers of all steam locomotive boiler operations, inspections, maintenance and repairs for ready reference. This should include, amongst other things:

- > Records of when the boiler was operated and who operated it (this may be in the locomotive operating and defects logbook)
- > Records of transfers to other locomotives, workshop/s, or storage
- > All maintenance records (refer to section 4 of AS 3873)
- > All defects found (including defect analysis and any fitness for service assessment)
- > All repair work completed (refer to section 4 of AS 3788)
- > All alterations made
- > Results of all testing and measurement undertaken
- > Details of any period of storage, with a preservation plan for extended periods (as per AS3788)
- > All incidents involving the boiler and subsequent investigation reports and corrective actions
- > Independent boiler inspector's reports and certifications

It is recommended that rail transport operators review and adopt the RISSB Code of Practice (which specifies the contents of the boiler history file) and supporting standards, as well as other relevant industry and Australian Standards as required. Alternatively they must demonstrate that their systems and processes achieve the same or a higher level of safety.

The rail transport operator must review referenced documents from time to time, to ensure they remain relevant to their railway operations and continue to control the relevant risks so far as is reasonably practicable. ONRSR would expect to see this review process set out in the SMS.

As per the requirements of the SMS (element 16 of schedule 1 to the National Regulations), a risk register must also be maintained. ONRSR would expect to see a number of specified risks relating to boiler safety listed with their associated controls. A single risk of 'boiler failure' is not detailed enough.

- Documented maintenance, repair and alteration procedures as part of the SMS (this should include the Inspection and Test Plan (ITP), certified by an independent inspector)
- Records of safety critical inspections and tests during operations
- Records of inspections, maintenance, repairs and alterations by competent persons, including independent certification for repairs and alterations (as necessary)
- Documented instructions for maintainers and repairers

- Detailed risk register

8 Inspection and certification of rail locomotive boilers

The rail transport operator is responsible for appointing a competent and independent boiler inspector, acting as the independent authority, to undertake the routine inspection and certification of each steam locomotive boiler. This activity is separate to the inspections that workers operating and/or maintaining the boiler would routinely carry out as part of their duties (as per AS 3873).

An inspector must be able to provide inspection services in accordance with the requirements of AS 3788 (refer Appendix Y for heritage boilers) and the RISSB Code of Practice. They should be qualified as per AS 4481.

The timing and method of inspections is prescribed by AS3788 (particularly section 4.7 and Appendix Y) and the RISSB Code of Practice. In short, this requires that inspections by an independent inspector should be annual (minimum as per AS3788 – refer Appendix Y for heritage boilers) and full internal inspections (as per the RISSB Boiler Code of Practice) are every 10 years, or as determined by a competent person (e.g. independent inspector). Other inspections are undertaken following a major repair or incident or where a fault is detected (more information on what may trigger an inspection is provided in AS 3788).

Evidence of independent inspection should be in the boiler history file and should include:

- > Certification that the boiler is safe to operate; and
- > Written inspection reports for each inspection (as per AS3788)

These may be contained in the same document but it must be clear that the inspector has attested to the integrity of the boiler and its fitness for service until the next scheduled inspection, covering the items covered in Appendix C. Certification that has been prepared to comply with WHS legislation may also be accepted, in addition to the report.

A rail locomotive boiler should not be operated without a current independent boiler's certification, which may include conditions within which the boiler may be operated. If certification is expired, minor maintenance and wash-outs may be undertaken but the boiler may only be operated/ fired-up as part of an inspection, which is overseen by the independent boiler inspector.

Operators must ensure that they can evidence that the risk to safety has been minimised SFAIRP at all times. ONRSR will also look for evidence that the rail transport operator has considered / actioned any recommendations from inspection reports. An operator would generally be required to undertake repairs to a steam locomotive boiler to correct defects that arise in-service or as identified by an independent boiler inspector. If a rail transport operator chooses not to undertake the recommendation, or not to undertake it in a reasonable timeframe, then they would have to demonstrate their reasons for not doing so.

- Current certification of inspection signed by an inspector (including electronic signature)
- Written inspection reports
- Evidence that recommendations have been / are being followed within a reasonable timeframe

8.1 Competence of an independent inspector

An independent inspector may be involved at various stages of a boiler's lifecycle, including to certify safety, provide advice on inspection, maintenance and repair requirements, and/ or to develop / verify design drawings, specifications or procedures if the originals are no longer available. The rail transport operator must be able to demonstrate that the inspector has the competence for the specific task, as per section 117 of the RSNL.

There is a distinction between in-service (periodic inspections), design, and fabrication inspectors – however these are collectively referred to as ‘boiler inspectors’. The responsibilities of these inspectors are described in SAA/SNZ MP76 and required competencies in AS 4481. The rail transport operator must demonstrate that the inspector has competency for the task, but generally:

- > Periodic inspections are undertaken by an in-service inspector (i.e. qualified with a relevant trade qualification, subject matter knowledge, skills and experience as appropriate – including sufficient knowledge of boiler operations)
- > Repairs that vary from the original construction are consulted and inspected by a fabrication inspector, who is usually suitably qualified in pressure welding (or riveted repairs, depending which is applicable) and pressure equipment, and may hold a certificate as a fabrication or welding inspector.
- > Alterations to the original design, or the preparation / alteration of drawings, specifications or procedures are verified by a design verifier, who is usually a suitably qualified and experienced professional engineer.

Examples of evidence of appropriate qualifications are provided in AS 3788 (Appendix V). There may also be relevant qualifications or units of competence under the AQF (refer to section 6).

Rail transport operators should verify the reputation and experience of an independent boiler inspector. ONRSR expects that inspectors hold at least 5 years’ experience relating to pressure equipment, with at least two years’ experience maintaining / inspecting a locomotive boiler (may be rail locomotive, traction engine, maritime boiler). This is in addition to the skills and qualifications required for the type of inspection.

In-service inspectors may hold additional qualifications relating to inspection, such as with the Australian Institute for the Certification of Inspection Personnel (AICIP), in addition to their subject matter knowledge, skills and qualifications. Any inspector undertaking design should be qualified as an engineer and registered with Engineers Australia.

Some guidance questions for assessing the competence of an inspector are provided at [Appendix B](#). Note that the qualifications of some inspectors may be available online.

- Evidence of the independent inspector’s competence, including appropriate trade/ tertiary qualifications and certificates of attainment under the AQF

8.2 Independence from undertaking maintenance or repairs

The independent inspector may be a member of the rail transport operator’s personnel or a contractor. However, the person must not have any responsibilities for or undertake any of the operational, maintenance or repair work on the boiler subject to inspection (i.e. they must be independent of this work and also have a proper degree of independence from those who are responsible).

Appendix A: Resources

A.1 Legislation

The RSNL and National Regulations are available from the ONRSR website at www.onrsr.com.au

A.2 ONRSR publications

- > Application of the AQF to Rail Safety Worker Competence Assessment Policy
- > Preparation of a Rail Safety Management System guideline
- > Small isolated line heritage operations – safety management system (SMS) guideline

Available from the ONRSR website at www.onrsr.com.au

A.3 Industry guidance and training and assessment

Code of Practice “*Inspection, maintenance and repair of rail locomotive boilers*” (RISSB, 2011 and updated from time to time). This CoP is specific to locomotive boilers and references relevant Australian Standards. Available for download from the ATHRA website at www.athra.asn.au

ATHRA *Fireman (boiler) (locomotive boiler) training and assessment package* and *Driver (reciprocating steam engine) training and assessment package*. Available for download from the ATHRA website at www.athra.asn.au

AQF units of competency and qualifications <https://training.gov.au>

A.4 Registered inspectors

Engineers Australia www.engineersaustralia.org.au (includes design and fabrication)

Australian Institute for the Certification of Inspection Personnel (AICIP) www.aicip.org.au

A.5 Australian Standards

Note that the type of boilers used in rail locomotives are ‘fire tube heritage boilers’ and classified as hazard level B pressure vessels.

| Inspection (and repair and alteration) | |
|--|---|
| AS/NZS 3788: Pressure equipment—In- service inspection | Minimum inspection and fitness for service requirements for all in-service pressure equipment, including rail locomotive boilers (fire tube heritage boilers). This standard should also be followed for repair and alteration procedures. |
| AS/NZS 4481:1997 Pressure equipment - Competencies of inspectors | Competencies required for design verifiers, fabrication inspectors and in-service inspectors of pressure equipment. |
| MP 76:1997 Pressure equipment— Inspection bodies and personnel | Responsibilities and certification requirements for inspection agencies and inspectors who undertake design verification, fabrication inspection and in-service inspection of pressure equipment. It complements AS/NZS 4481, which sets out the competencies of design verifiers, fabrication inspectors and in-service inspectors. |
| AS 1228:2016 Pressure equipment — Boilers | The design of every steam locomotive boiler is contained in this standard. Note that every steam locomotive boiler is classified as hazard level B pressure vessel (AS 4343). |

| | |
|---|---|
| (supersedes AS 1228-2006) | Specifies requirements for materials, design, construction, inspection and testing of boilers as defined in AS/NZS 1200. |
| Australian Standard 1210-2010 – Pressure Vessels | Minimum requirements for the materials, design, manufacture, testing, inspection, certification, documentation and dispatch of fired and unfired pressure vessels constructed in ferrous or non-ferrous metals by welding, brazing, casting, forging, or cladding and lining and includes the application of non-integral fittings required for safe and proper functioning of pressure vessels. This Standard also specifies requirements for non-metallic vessels and metallic vessels with non-metallic linings. |
| Australian Standard 4037-1999 – Pressure Equipment – Examination and Testing | Requirements for non-destructive examination (NDE) methods for the examination of boilers, pressure vessels, piping and their components. Also specifies requirements for testing and qualification of non-destructive examination personnel. |
| AS/NZS 1200:2015 : Pressure equipment (Parent Pressure Equipment Standard) | Sets out basic requirements and good practice for the design, materials, manufacture, examination, testing, installation, conformity assessment, commissioning, operation, inspection, maintenance, repair, alteration and disposal of pressure equipment (boilers, pressure vessels and pressure piping) but excluding gas cylinders. Includes detailed requirements for various pressure equipment by direct reference to a range of Australian, New Zealand and other Standards. |
| Operation and maintenance | |
| AS 3873 Pressure equipment – Operation and maintenance | <p>Specifies minimum requirements and guidance on the operation and maintenance of boilers, pressure vessels, associated control and safety equipment, piping and auxiliaries, and in the execution of such work.</p> <p>Applies to commissioning, operation, maintenance, routine inspection, storage and disposal, together with specific requirements for safety management systems, including where appropriate risk assessment.</p> <p>Applies to pressure equipment covered by AS/NZS 1200 to the extent applicable for the hazard level.</p> |
| Australian Standard 2593-2004 – Boilers – Safety Management and Supervision Systems | <p>Attended boilers - section 7 is particularly relevant.</p> <p>Requirements for the <i>operation</i> of boilers, including unattended, limited attendance and fully attended. It includes the special features within the control, management and supervision systems, associated valves and fittings, housing and installation for those boilers operating in the unattended or limited attendance modes.</p> |
| AS/NZS 3992 Pressure equipment—Welding and brazing qualification | Requirements for the qualification of welding and brazing procedures, welders and brazers, and requirements for production weld testing other than non-destructive examination, when used in the manufacture, alteration and repair of boilers, pressure vessels, pressure piping and their components. |
| AS/NZS 1796 Certification of welders and welding supervisors | Requirements necessary for the granting of certificates to experienced welders engaged in the various welding processes used in the manufacture of pressure equipment, such as boilers, pressure vessels and associated piping, as defined in AS/NZS 1200, as well as, other applications requiring a prescribed standard in the theory and practice of welding. |
| Other | |
| 4942 Pressure Equipment – Glossary of Terms | Alphabetical listing, with illustrations where appropriate, of terms and definitions from various pressure equipment-related Standards referenced in AS/NZS 1200. |

Appendix B: Competency guide

The following questions should be considered when deciding if a person has the skills, knowledge and experience to operate, maintain, inspect or repair a steam locomotive boiler. A person may conduct more than one of these activities for a rail transport operator under various role titles (for example, a driver may also operate the boiler) and must be able to demonstrate competence in each activity they undertake.

| Area of competence | Competence guide | Operate | Maintain | Repair | Inspect |
|---|--|---------|----------|--------|---------|
| Knowledge *also see section 6 for relevant AQF units of competence | 1. The person has a mechanical associated trade or engineering qualification (e.g. mechanic, fitter, boilermaker, marine engineer etc.) If not, the person can demonstrate they have the required knowledge and experience of similar boilers | ✓ | ✓ | ✓ | ✓ |
| | 2. The person can demonstrate they have relevant knowledge in the operation, safety features, maintenance procedures, common or foreseeable failure modes of the boiler | ✓ | ✓ | | ✓ |
| | 3. The person can distinguish between a safety inspection and routine maintenance | | ✓ | | ✓ |
| | 4. The person understands engineering maintenance concepts (e.g. tolerance, wear allowance and fatigue life) and can implement an engineering change process | | ✓ | ✓ | ✓ |
| | 5. The person has sound knowledge of the threshold criteria for defects and faults (inc ability to identify degradation mechanisms, conditions that may result in accelerated deterioration and fatigue related issues) | | ✓ | ✓ | ✓ |
| | 6. The person can demonstrate knowledge of relevant Australian Standards and their purpose | | ✓ | ✓ | ✓ |
| Industry experience | 7. The person has at least 5 years' experience relating to pressure equipment, with at least two years' experience maintaining / inspecting a locomotive boiler (may be rail locomotive, traction engine, maritime boiler). | | | | ✓ |

| | | | | | |
|----------------------|--|---|---|---|---|
| | 8. The person has industry experience and currency (e.g. logbooks, references, position profiles) | | | | ✓ |
| Reputation | 9. The person is reputable and able to provide referees who can attest to the quality and nature of their work The rail transport operator should contact referees for advice against these criteria. | | ✓ | ✓ | ✓ |
| | 10. The person can show proper standards of professional probity | | | | ✓ |
| Communication skills | 11. The person can explain what needs to be done on the boiler in a manner that the rail transport operator understands | | | | ✓ |
| | 12. The person can write reports or maintain log books that are legible, relevant, and easy to understand (i.e. they can demonstrate a requisite level of communication skills) | | ✓ | ✓ | ✓ |
| | 13. The person has basic record-keeping skills | ✓ | ✓ | ✓ | ✓ |
| Technical expertise | 14. The person is familiar with technical standards for the boiler | | | | ✓ |
| | 15. The person understands the design and construction of the boiler | | ✓ | ✓ | ✓ |
| | 16. The person can demonstrate acceptable repair methods | | ✓ | ✓ | ✓ |
| | 17. The person is able to review relevant documentation (e.g. operation and maintenance manuals provided with the boiler and maintenance records) to determine if the boiler has been satisfactorily maintained | | | | ✓ |
| | 18. The person can estimate the remaining life of worn areas and components to ensure that the boiler is safe to operate until the next annual or major inspection | | | | ✓ |
| | 19. The person is able to assess information gathered during inspection (including an examination of the boiler) to determine if it is safe for continued operation (evidence may include registration with AICIP) | | | | ✓ |
| | 20. The person has knowledge / skills in non-destructive examination (NDE) techniques / non-destructive testing (NDT), what types of | ✓ | ✓ | ✓ | ✓ |

| | | | | | |
|--|--|---|---|---|---|
| | NDEs / NDTs should be applied to detect potential failures and how the results are interpreted? | | | | |
| Understanding the RSNL & risk management | 21. The person is familiar with safety duties and requirements of the Rail Safety National Law | ✓ | ✓ | | ✓ |
| | 22. The person can identify potential hazards associated with the operation of the boiler, including commissioning, installation, use, maintenance and disposal | ✓ | ✓ | ✓ | ✓ |
| | 23. The person is familiar with the risk assessment for the boiler and can identify foreseeable threats | ✓ | ✓ | ✓ | ✓ |
| | 24. The person's approach consistent with the principle of ensuring the highest level of safety (eliminating or minimising the risk to safety <i>so far as is reasonably practicable</i>) | ✓ | ✓ | ✓ | ✓ |
| | 25. The person is aware of the limits of their authority and does not operate outside of those limits | ✓ | ✓ | ✓ | ✓ |

Appendix C: Certification of Inspection

The independent boiler inspector should prepare a full report and certify the safety of the boiler to be operated following all inspections.

This certification should include the following information:

- > The details of the person undertaking the certification. If the person is a contractor, then the details of the company and any relevant licences or trade affiliations/ registrations (for example, recognition as a registered professional engineer of Queensland (RPEQ)).
- > The date the certification is given.
- > A statement that the person undertaking the certification is competent and authorised by the rail transport operator to undertake the certification.
- > Reference to the engineering standards contained in the rail transport operator's SMS relevant to the item being certified.
- > The scope of the certification; that is, defining the item being certified and if appropriate, any limitations/ conditions that have been applied (for example, restricted operating pressure or blanked tubes).
- > A statement that the certifying person believes the item being certified is fit for purpose. If it is not fit for purpose the certifying person should state why and include the required corrective actions.
- > The signature of the person undertaking the certification.
- > Reference to supporting inspection and/or testing records containing information about what the certifying person inspected and/or tested.