

# 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 due to poor 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 examine, operate, maintain and repair boilers 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 also form part of the way that operators demonstrate compliance with the RSNL. 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 - 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: 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 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* as it applies in each state and territory.
- > **National Regulations** – means the *Rail Safety National Law National Regulations 2012*.
- > **Rail locomotive boiler** – includes heritage boilers (defined by AS 3788 - 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 '**must**' indicates a legal requirement to comply.

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 it complies with the legislation.

## 5 Relevant legislation

A key requirement of accreditation for rail transport operators is to implement and comply with a SMS. This is to ensure the safety of their railway operations SFAIRP.

- > Section 99 of the RSNL and Schedule 1 of the National Regulations outline the requirements of a SMS including that the risks and assets are managed appropriately.
- > Section 52 sets out the duties of rail transport operators.
- > Section 117 of the RSNL imposes obligations on rail transport operators to ensure 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. 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 Risk assessment

Central to the rail safety regulatory regime in Australia is the rail transport operator's ability to identify, assess and manage risks to safety, SFAIRP. It is essential that all rail transport operators conduct a thorough assessment of all risks associated with operating steam locomotives and their boilers.

ONRSR expects to see specific risks relating to boiler safety listed in its assessment along with their associated controls, noting:

- > identifying a single risk of 'boiler failure' is not detailed enough.
- > A risk assessment must consider:
  - all hazards associated with the operation of a steam boiler that ought to be known, and
  - all controls available to manage the risk.

The risk assessment needs to show:

- > clear links in the description of the control measures adopted to where the detail of the control measure is documented in the rail transport operator's safety management system, for example:
  - relevant inspection, maintenance and certification procedures and
  - competency requirements.
- Detailed risk register (as per element 16 of schedule 1 to the National Regulations)

## 7 Inspection and certification of rail locomotive boilers

The rail transport operator is responsible for appointing a competent and independent boiler inspector.

- > The boiler inspector will act as the independent authority:
  - to undertake the routine inspection, and
  - to provide 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).

The independent boiler 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 AS 3788 (particularly section 4 and Appendix Y) and the RISSB Code of Practice.

- > In short, this requires that:
  - inspections by an independent boiler inspector should be annual (minimum as per AS 3788 – 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 inspections should be in the boiler history file and should include:

- > certification that the boiler is safe to operate,
- > any previous work carried out on the boiler to facilitate the annual inspection (e.g. what tubes were removed and reinstalled so that the inspector can access the barrel) and
- > written inspection reports for each inspection (as per AS 3788).

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, and
- > covered the items set out 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. The certification 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 they can provide evidence the risk to safety has been minimised SFAIRP at all times. ONRSR will look for evidence that the rail transport operator has considered/actioned any recommendations from inspection reports. An operator is generally 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 have to demonstrate their reasons for not doing so.

- Current certification of inspection signed by an inspector.
- Written inspection reports including timeframes for actions to be undertaken
- Evidence that recommendations have been / are being followed within a reasonable timeframe

## 7.1 Competence of an independent inspector

An independent inspector may be involved at various stages of a boiler's lifecycle, including:

- > to certify safety
- > to provide advice on inspection, maintenance, and repair requirements
- > 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 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, ). 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 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

## 7.2 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 have a proper degree of independence from those who are responsible).

## 8 Maintenance, repairs, and alterations of rail locomotive boilers

In cases where original design and constructions standards are no longer available, the rail transport operator should refer to the RISSB Code of Practice. The Code of Practice advises where repairs are required and no past proven railway practice exists, the owner/user/operator must develop a repair proposal supported by technical (engineering) expertise and review.

Any maintenance or repair needs to be 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. An example of a repair that may be inspected by a competent person is the



replacement of fire or flue tubes, the process of which does not vary the original construction but may damage the tubeplates if not performed correctly.

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 (i.e., an inspector with a supporting engineering qualification). A supporting change management process and documentation should be in place.

## **8.1 Maintenance plan and procedures**

Rail transport operators should have an inspection and maintenance plan for the steam locomotive boilers they operate. This plan should specify all the different types of inspection and maintenance activities that are required to keep the boiler and its fittings in safe condition, how often each is undertaken and the competency requirements for each task

## **8.2 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, among 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,
- > any works undertaken to facilitate access for the independent boiler inspector (e.g. what tubes were removed and reinstalled so that the inspector can access the barrel.)

It is recommended 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 their systems and processes achieve an equal or better 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 SFAIRP. ONRSR expects to see this review process set out in the SMS.

- ☑ 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

### 8.3 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 rail transport operators must consider what skills and knowledge, trade and/or professional engineering qualifications are needed.

Rail transport operators are 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 engineering qualifications or trade certificates (for example, mechanical fitting, boiler making, welding) and will most often be evidenced by extensive work experience. If a worker is required to fire up a boiler to undertake maintenance they must also be able to demonstrate competency as a boiler operator.

- ☑ Evidence of engineering qualifications in relevant disciplines
- ☑ Evidence of trade qualifications in relevant disciplines
- ☑ Details of the experience and skills that are relevant to steam locomotive and boiler maintenance tasks.

## 9 Operation of rail locomotive boilers and reciprocating steam engines

### 9.1 Operating procedures/ instructions

A rail transport operator should provide its workers (and to ONRSR on request) documented instructions in relation to safe locomotive boiler operation. These instructions should be consistent with the requirements of AS 3873 (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, among other things, the following minimum instructions:

- > Pre-light-up examination
- > Light-up procedure
- > Light-up examination
- > 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 examination
- > Boiler storage procedures
- > Preparing a boiler for certification inspection
- > 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.

There must also be operating instructions/procedures regarding the operation of the reciprocating steam engine and locomotive braking systems.

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

## 9.2 Competence to operate a boiler

Rail transport operators must meet the requirements of section 117 of the RSNL to show that their workers 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 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.

Care should be taken to verify the content of a qualification or unit of competence meets the competency requirements for safe operations. For instance, the following AQF units of competence at face value appear to be relevant to the operation of locomotive boilers (and necessary to obtain a High Risk Work Licence for non-heritage boilers):

- > MSMBLIC001 Licence to operate a standard boiler
- > MSMBLIC002 Licence to operate an advanced boiler
- > UEPOPL003 Licence to operate a reciprocating steam engine

However, these courses may be assessed based on static, water tube factory boiler with modern automatic controls, which are fundamentally different to a locomotive boiler that is mobile, fire tube and fully manual in operation. This means unless the assessment of these units has been undertaken on a locomotive boiler, or additional training/assessment has been undertaken, the AQF statement of attainment and High Risk Work Licence are (on their own) insufficient for demonstrating the worker is competent to operate a locomotive boiler safely.

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)
- > TLIF0028 Respond to abnormal situations and emergencies when operating rail traffic (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). In cases where a rail transport operator considers it not reasonably practicable to use relevant AQF qualifications or units of competency they should:

- > document why it is not reasonably practicable to do so; and
- > outline their alternative approach to ensuring their boiler operators have the competence to operate the boiler safely (i.e., the material forming the basis of the instruction and training provided, competency assessment tools and a description of how the assessor has been determined to be suitable to perform that role).

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

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

### **9.3 Evidence of competence and maintenance of competency**

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 what training and instruction is provided
- > How the person's competency is assessed
- > A description of how the assessor has been determined to be suitable to conduct competency assessments.

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.

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

- > Records 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 or equivalent, as set out below in this section)
- > Statement of attainment for relevant qualifications or units of competence under the AQF, combined with additional skills, training, qualifications as necessary
- > Statement of attainment and/or High Risk Work License (the license may be current or expired) from the boiler standard or advanced AQF courses/Licence to operate a reciprocating steam engine, combined with additional skills, training, qualifications as required to verify it is directly relevant to the type of boiler to be operated.
- > 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 with evidence of how the rail transport operator has assessed competency to ensure the worker can operate the boiler safely.

For each worker there should be a record of training/ instruction to operate the specific boiler or reciprocating steam engine being used by the rail transport operator. This must include training the worker on any risks specific to the workplace and with the boiler. A 'Verification of Competence' sheet where an assessor confirms the worker's competence has been verified on each type of boiler/class of locomotive the worker is authorised to operate would provide evidence of such competencies.

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 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, must 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 or equivalent assessment qualification (as per the *Standards for Registered Training Organisations 2015*) 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 statements of attainment)
- Training was undertaken by a competent person and assessment has been undertaken independently by a Certified Trainer and Assessor

## 10 Emergency procedures

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

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

Training for an emergency boiler shutdown should include procedures to identify when an emergency boiler shutdown is required.

ONRSR expects 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

## Appendix A: Resources

### A.1 Legislation

The RSNL and National Regulations are available from the ONRSR website at [www.onrsr.com.au](http://www.onrsr.com.au)

The *Standards for Registered Training Organisations (RTOs) 2015* under the *National Vocational Education and Training Regulator Act 2011* <https://legislation.gov.au>

### A.2 ONRSR publications

- > Application of the AQF to Rail Safety Worker Competence Assessment Policy
- > Safety Management System guideline
- > Guidance for Tourist & Heritage and other smaller, less-complex operators webpage

Available from the ONRSR website at [www.onrsr.com.au](http://www.onrsr.com.au)

### A.3 Industry guidance and training and assessment

“Code of Practice - Inspection, maintenance and repair of rail locomotive boilers” (RISSB, 2018 and updated from time to time). This Code of Practice is specific to locomotive boilers and references relevant Australian Standards. Available free to ATHRA members or for purchase by non-members from ATHRA ([www.athra.asn.au](http://www.athra.asn.au)). Also available to RISSB members ([www.rissb.com.au](http://www.rissb.com.au)).

ATHRA *Fireman (boiler) (locomotive boiler) training and assessment package* and *Driver (reciprocating steam engine) training and assessment package*. Available from ATHRA. See their website at [www.athra.asn.au](http://www.athra.asn.au)

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

#### A.4 Registered inspectors

Engineers Australia [www.engineersaustralia.org.au](http://www.engineersaustralia.org.au) (includes design and fabrication)

Australian Institute for the Certification of Inspection Personnel (AICIP) [www.aicip.org.au](http://www.aicip.org.au)

#### A.5 Australian Standards

This list is for general guidance only and rail transport operators must ensure that standards referenced are relevant and that revision status is appropriate.

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 Pressure equipment - Competencies of inspectors	Competencies required for design verifiers, fabrication inspectors and in-service inspectors of pressure equipment.
AS4343 Pressure Equipment – Hazard Levels as a hazard B pressure vessel	Specifies criteria for determining the hazard levels of various types of pressure equipment to AS/NZS 1200. It also classifies fluids for use with pressure equipment.
AS3788 Pressure Equipment – In Service Inspection	Specifies minimum requirements for the inspection, repair and alteration of in-service boilers, pressure vessels, piping, safety equipment and associated controls, and gives guidance on the execution of such activities. These inspections include the initial inspection after installation and prior to commissioning.
MP 76 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 Pressure equipment — Boilers	<p>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).</p> <p>Specifies requirements for materials, design, construction, inspection and testing of boilers as defined in AS/NZS 1200.</p>
Australian Standard 1210 Pressure Vessels	<p>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.</p>
Australian Standard 4037 Pressure Equipment – Examination and Testing	<p>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.</p>
<p>AS/NZS 1200 Pressure equipment</p> <p>(Parent Pressure Equipment Standard)</p>	<p>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.</p>
<b>Operation and maintenance</b>	
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 AS 2593 Boilers – Safety	<p>Attended boilers - section 7 is particularly relevant.</p>



Management and Supervision Systems	Requirements for the operation of boilers and other devices including any connected economizer or superheater or deaerator. It includes the special features within the control, management and supervision systems, associated valves and fittings, housing, access and installation for those boilers and other devices operating in the unattended or attended modes. Details the checking, testing, supervision and maintenance requirements for each category of attendance to support continued safety.
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 for the qualification of welders, welding supervisors and welding inspectors engaged in welding processes used in the manufacture of pressure equipment, such as boilers, pressure vessels and associated piping, as well as other applications requiring a prescribed standard in the theory and practice of welding.
Other	
AS 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.

Rail transport operators should also consider application of:

- original design standards (such as CB1-1957, part 3) where applicable
- other standards covering similar items, such as pressure piping and smaller attached equipment, such as pressure relief valves.

## 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 9 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).				✓
	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.