➢ Boiler Explosions Acts, 1882 and 1890. – Ceased 1\textsuperscript{st} Jan 1975

➢ Factories Act 1964 (Excluded locomotives in railway companies, but included locomotives in factories)

❖ Why exclude railway companies?
   Self regulating
   Safety Management System
   Risk assessment's

Rob Le Chevalier
Engineering Manager / Director
South Devon Railway Engineering Ltd.
Health and Safety at Work etc. Act 1974

CHAPTER 37

ARRANGEMENT OF SECTIONS

PART I

HEALTH, SAFETY AND WELFARE IN CONNECTION WITH WORK, AND CONTROL OF DANGEROUS SUBSTANCES AND CERTAIN EMISSIONS INTO THE ATMOSPHERE

Preliminary

1.—(1) The provisions of this Part shall have effect with a Preliminary view to—

(a) securing the health, safety and welfare of persons at work;

(b) protecting persons other than persons at work against risks to health or safety arising out of or in connection with the activities of persons at work;

• At work

• Employers

3.—(1) It shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in his employment who may be affected thereby are not thereby exposed to risks to their health or safety.

(2) It shall be the duty of every self-employed person to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that he and other persons (not being his employees) who may be affected thereby are not thereby exposed to risks to their health or safety.

• Non employees

• Not just the employer

• To prevent harm

Rob Le Chevalier

Engineering Manager / Director

South Devon Railway Engineering Ltd.
- Directive 97/23/EC
  - SI 1999/2001
- Directive 2014/68/EU
  - SI 2016/1105

Pressure Equipment Safety Regulations 2016 (SI 2016/1105)
also known as PSR

Pressure Systems Safety Regulations 2000 (SI 2000/128)
also known as PSSR
- 2nd edition 2014
- Amended by SI 2016/1105
The South Devon Railway

PSSR references,
ACOP Guidance notes and requires,
Written Scheme of Examination
Keeping of records

The Pressure Systems Safety Regulations 2000

ARRANGEMENT OF REGULATIONS
PART I INTRODUCTION
1. Citation and commencement.
2. Interpretation.
3. Application and duties.

PART II GENERAL
4. Design and construction.
5. Provision of information and marking.
6. Installation.
7. Safe operating limits.
8. Written scheme of examination.
9. Examination in accordance with the written scheme.
10. Action in case of imminent danger.
12. Maintenance.
14. Keeping of records, etc.

PART III MISCELLANEOUS
16. Tiers.
17. Power to grant exemptions.
18. Repeals and revocations.

Approved Code of Practice and guidance

The Pressure Systems Safety Regulations 2000 (PSSR) cover the safe design and use of pressure systems. The aim of PSSR is to prevent serious injury from the hazard of stored energy (pressure) as a result of the failure of a pressure system or one of its component parts.

The revised PSSR ACOP and guidance is aimed at dutyholders under PSSR who are involved with pressure systems used at work. It is for users, owners, competent persons, designers, manufacturers, importers, suppliers and installers of pressure systems used at work.

Since the last edition, the ACOP and guidance has been updated for clarity. The content has not been radically changed, as it was fit for purpose. The main changes to this publication are as follows:

- The decision tree on whether PSSR applies has been moved to the front of the book and explanatory notes have been added to it, to help readers decide if PSSR applies to them or not.
- A new Appendix has been added to provide clarity on how to apply PSSR in a proportionate manner to small pressure vessels in schools.
- The section on the legal background to PSSR and related legislation has been removed as it was out of date.

The Regulations themselves have not changed at all, so dutyholders’ responsibilities remain unchanged.

Rob Le Chevalier
Engineering Manager / Director
South Devon Railway Engineering Ltd.
Regarding Inspection:
Determining when and how to examine needs to be influenced by risk assessment, good practice and the original railway inspection regimes.

Written Scheme of Examination

- Examination
- Operation
- Maintenance
- Keep Records

Rob Le Chevalier
Engineering Manager / Director
South Devon Railway Engineering Ltd.
PUWER section 5 and 6
Every employer shall ensure that work equipment is maintained in an efficient state.
These plus much other legislation are there to instruct how to make the equipment and its use safe to the users and anyone who may be effected by the equipment.

Cornerstone of this is Risk Assessment

Need to determine what is safe
What is the experience of others
Good practice
Guidance notes
Risk assessment

Make sure nobody is hurt
General Boiler Examination

An internal boiler examination having the same content as that defined in the 7 yearly Internal Boiler Examination defined in MT/276.

General Mechanical Examination

A locomotive examination having the same content as that defined in the 7 Yearly Heavy Mechanical Examination defined in MT/276.

5.1.7 Where locomotives detailed in sub-paragraph 5.1.6 are proposed for registration, the boiler of such locomotives shall be the subject of valid and satisfactory hydraulic and steam test certificates. Full records detailing all work carried out at the last General Boiler Examination shall be made available to the Certification Body. Such repairs shall be strictly in accordance with the requirements contained in MT/276 and the normal period for General Boiler Examination, defined in sub-paragraph 5.2.8 shall not be exceeded. If full adherence to the requirements of MT/276 cannot be demonstrated, the boiler shall be subjected to a General Boiler Examination and satisfactory hydraulic and steam pressure tests prior to registration.

New RSSB engineering requirements for steam locomotives  RIS-4472-RST
Nov 2017

If I don’t run on the network then I can ignore it!
OK, but are you safe?
When it hurts someone what will be your defence?
MT276 Requires No NDE Inspection.

For boilers does not dictate the inspection methods for NDE beyond, visual, pressure and hammer testing.

Rail safety publication 6 (HSG 29) Has guidance on testing but nothing on NDE
How to determine:

What to inspect
When to inspect
How to inspect
Who does the inspection
What to record

Written schemes of examination
Pressure Systems Safety Regulations 2000

Under the Pressure Systems Safety Regulations 2000, users and owners of pressure systems are required to demonstrate that they know the safe operating limits (principally pressure and temperature) of their systems, and that they are safe under those conditions.

They need to ensure that a suitable written scheme of examination is in place before the system is operated. They also need to ensure that the system is actually examined in accordance with the written scheme of examination.

This publication complements the HSE leaflet Pressure systems: A brief guide to safety. It provides guidance on drafting written schemes of examination, but it cannot cover all relevant aspects of the Regulations. The ‘Find out more’ section at the end of the leaflet lists detailed guidance.

What is a written scheme of examination?

A written scheme of examination is a document containing information about selected items of plant or equipment which form a pressure system, operate under pressure and contain a ‘relevant fluid’.

The term relevant fluid is defined in the Regulations and covers compressed or liquefied gas, including air, at a pressure greater than 0.5 bar (approximately 7 psi) above atmospheric pressure; pressurised hot water above 110 °C; and steam at any pressure. Typical contents of a written scheme of examination include:

- identification of the items of plant or equipment within the system;
- those parts of the system which are to be examined;
- the nature of the examination required, including the inspection and testing to be carried out on any protective devices;
- the preparatory work needed for the item to be examined safely;
- where appropriate, the nature of any examination needed before the system is first used;
- the maximum interval between examinations;
- the critical parts of the system which, if modified or repaired, should be examined by a competent person before the system is used again;
- the name of the competent person certifying the written scheme of examination; and
- the date of certification.
Non Destructive Examination, NDE

In service, at washouts
Mainly in house, visual – flair lamp (LED) endoscope (borescope), Mirrors
Acoustic by hammer test, sound in steam

Annual service and Examination
Mainly in house, visual, - flair lamp (LED), endoscope (borescope)
Acoustic by hammer test and ultrasonic thickness testing, Dye Pen, MPI,
AND examined by the Competent person to verify thickness checks and provide an independent view

7/10 Year Examination
In house, as with the annual exam plus any areas included in the written scheme of examination as determined by the Competent Person

New components
As required by the Competent Person
Example of scope of work from the Competent person to an approved NDE engineer

(a) Firebox Outer Wrapper (Carbon Steel)
- All backplate wrapper weld attachments and valve pads subjected to 100% MPI.
- Backplate door ring region subjected to 100% MPI and also UT thickness mapping (external) from plate transition/door radii locations.
- Backplate corner radii (both LHS & RHS) subjected to UT thickness mapping extending vertically downwards from top corner wash-out plug to foundation ring level.
- Backplate (both LHS & RHS) subjected to UT thickness mapping extending vertically downwards to plate regions between the outside rows of last two vertical rows of stays and towards the above corner radii locations.
- LHS outer wrapper horizontal repair weld (~12" from FR) subjected to 100% MPI.
- RHS outer wrapper horizontal repair weld (~12" from FR) subjected to 100% MPI.
- Throatplate subjected to UT thickness mapping.
- All crown wrapper weld attachments and valve pads subjected to 100% MPI.
- Crown wrapper regions around both safety valve pad and whistle pad locations subjected to localized UT thickness mapping.
- All mudhole door penetrations and existing wash-out plug regions subjected to 100% MPI.
- All exposed outer wrapper plate foundation ring stay holes/ligaments subjected to 100% MPI.
- All existing copper side, back and throat plate stays subjected to 100% long range (LR) ultrasonic testing regime.

(b) Firebox Inner Wrapper (Copper – C107)
- Firebox tubeplate subjected to 100% DPI to all plate/tube ligament regions.
- Firebox vertical corner regions (4 offt) subjected to 100% DPI for the full plate height and extending around corner radii towards stay holes/ligaments.
- Exposed firebox foundation ring stay holes/ligaments subjected to 100% DPI.

(c) Foundation Ring (Carbon Steel)
- Removed and subjected to 100% UT and MPI at all corner radii locations.

(d) Boiler Barrel (Carbon Steel)
- Riveted firebox to barrel joint subjected to MPI at clock co-ordinates of 3, 6, 9 and 12 o’clock positions respectively.
- Boiler barrel strake (1 off) subjected to shell UT thickness mapping. Additional concentrated UT thickness measurements at the lower shell locations between 4 o’clock to 8 o’clock positions.
- Boiler barrel longitudinal welded joint subjected to 100% UT and MPI.
- Riveted boiler barrel dome joint subjected to 100% MPI.

(e) Smoke Box (Carbon Steel)
- Smokebox tubeplate subjected to 100% MPI to all plate/tube ligaments, weld attachments and wash-out plug locations.
- Smokebox tubeplate subjected to UT thickness mapping. Additional concentrated UT thickness measurements to the lower tubeplate between 3 o’clock and 9 o’clock positions and around lower wash-out plug(s).
The South Devon Railway

- Boiler after NDE
• New firebox of welded construction after NDE
HERITAGE RAILWAY ASSOCIATION

GUIDANCE NOTE

MATERIALS & Non-Destructive Testing
Supporting the Steam Locomotive Boiler series of Guidance Notes

Purpose
This document describes good practice in relation to its subject to be followed by Heritage Railways, Tramways and similar bodies to whom this document applies.

Endorsement
This document has been developed with, and is fully endorsed by, Her Majesty’s Railway Inspectorate (HMRI), a directorate of the Office of Rail Regulation (ORR).

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HERITAGE RAILWAY ASSOCIATION

GUIDANCE NOTE

EXAMINATION IN SERVICE
of Steam Locomotive Boilers

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Highly dependent on the view of the Competent Person

Uniformity of approach to the application of NDE using traditional and new methods

Recommend alignment of expectations of the ‘Competent Person’ and the HRA to capture best practice for steam locomotive boilers for future operations