HERITAGE RAILWAY ASSOCIATION

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BOILER CODE OF PRACTICE (BCOP)

GUIDANCE NOTE

QUALITY ASSURANCE

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.

Development

This document has been developed by boiler experts in consultation with His Majesty's Railway Inspectorate (HMRI) a directorate of the Office of Rail and Road (ORR). The document HGR B9000 sets out the background to setting up the Boiler Code of Practice Committee (BCOP).

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Supply

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Registered office: The Railway Station, Station Road, Havenstreet, Ryde, England, PO33 4DS

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1. Introduction

a) This Guidance Note is one of a series dealing with Locomotive Boilers that were produced by the "Steam Locomotive Boiler Codes of Practice" practitioners meetings.

b) Railway locomotive boilers are designed to create, store and distribute steam at high pressure. The working life of such a boiler can be considerably shortened if due care is not taken at all stages of inspection, repair, running maintenance and day-to-day running.

c) In the past there have been a series of accidents and explosions due to work being undertaken without having due regard to the inherent risks involved. It is with that in mind that HMRI and HRA set up the series of meetings of boiler practitioners to discuss the issues distil, good practice and codify it into this series of Guidance Notes.

d) This guidance is written for the assistance of people competent to perform these tasks. In places the terminology used may be specific to such practitioners.

e) This guidance should also be useful to those in a supervisory or more general role. However no work should be undertaken unless the persons concerned are deemed competent to do so.

2. Recommendations

a) This guidance note is issued as recommendations to duty holders.

b) Where duty holders decide to take actions that are not in agreement with these recommendations, following appropriate risk assessments or for other reasons, it is recommended that those decisions are reviewed by the senior management body of the organisation concerned and a formal minute is recorded of both the decision reached and the reasons for reaching it.

3. Dimensional Notation

a) The dimensions in this document are variously described in a mixture of imperial and metric units. Where practical, equivalent dimensions have been shown but in some cases the dimensions do not easily equate and so the units in force at the time that the original designs were documented have been used.

4. Personal Protective Equipment

a) Before undertaking any work a risk assessment must have been conducted.

b) Protective equipment is to be supplied and used at work wherever there are risks to health and safety that cannot be adequately controlled in other ways.

c) The equipment must be:

   i) Compliant with the latest Personal Protective Equipment regulations;

   ii) Properly assessed before use to ensure it is suitable;

   iii) Maintained and stored properly;

   iv) Provided with instructions on how to use it safely and

   v) Used correctly by those undertaking the work.

5. Purpose

a) The purpose of this document is to provide guidance and raise awareness on the typical process controls necessary to ensure locomotive boilers are in a fit and safe state.

b) With hindsight, people become 'wise after an incident' as to how it could have been avoided. Quality Assurance aims to address these matters to prevent the incident from happening in the first place.

c) It is aimed towards making senior management aware and supporting those officers responsible for ensuring that all aspects of their boiler management systems are properly established and maintained.

6. Scope

a) This document emphasises the need to ensure that the appropriate controls are maintained at all stages of the boiler lifecycle. The document aims to provide guidance in accordance with existing regulations, law and best practice in quality / safety management.

b) This Guidance Note identifies a portfolio of controls and evidence that is necessary to achieve this principle.

c) There is an important issue when considering the scope of these controls. They apply to all loco boilers on the 'Users' site including privately owned and locomotives on loan. Specific and equivalent arrangements to ensure safety must be applied to locomotives loaned from other organisations prior to them being brought into operation on the User's site. Additionally these controls apply to Contractors working on boilers both on and off site.

7. Responsibilities

a) The boiler user organisation (Duty holder) should appoint a suitably qualified and experienced individual to act as 'Responsible Person' to oversee the management actions identified in these Guidance Notes. Such a responsible person is often referred to as the CME (Chief Mechanical Engineer). They should be completely independent of any locomotive owner or the locomotive's boiler inspector.

b) This person has overall responsibility for the wellbeing of boilers during the various life cycle stages. They should also have sufficient independent authority to prohibit the raising of steam in any boiler if there is any doubt about its safety.

c) The Responsible Person will have authority to apply appropriate standards of repair, maintenance, operation, etc for items that they are responsible for. The Responsible Person should have the power to recommend to the governing body that an independent boiler inspector be appointed in cases of any dispute – often the governing body' insurers will be able to recommend a suitably qualified individual.

8. General Principles

In the first instance these controls and requirements give the impression of being very onerous, overwhelming and confusing. However, railway preservation staff are already aware of many of the controls, and that they are both necessary are based on a certain degree of common sense. In specialist areas many of the requirements are laid down in the Pressure System Safety Regulations 2000 and other legislation. The safety of the railway at all times is of paramount importance.

9. Quality Assurance Principles

a) The assurance of quality means:-

Providing a serviceable locomotive boiler and associated pressure systems which are fit for purpose and that will meet the requirements of service duty and safety that are placed upon them.

b) Many organisations or contractors will require a more formal demonstrable Quality Assurance System based upon ISO 9001, 2015.

c) Quality Assurance arrangements comprise of practical and reasonable steps from beginning to end of process/life cycle. One example is keeping records on a boiler to ensure traceability of the work elements carried out – this comes under the Written Scheme of Examination (see B9260). Inputs into a process must also have an output. For example, a Work Instruction for a task is an input. This input ultimately creates an output i.e. a record. Without all steps being completed, the quality of work is compromised.

d) Key to remember is that 'quality cannot be inspected into a product; rather it must be built in at every stage'- lest one item causes a weakness in the chain of processes.

10. Appropriate Quality

a) Means targeting effort on implementing controls for certain specific tasks that will be pivotal to achieving adequacy.

b) The level of quality assurance to be applied should be proportional to the significance of the task. This is determined by considering the consequences of failure if the task were to be completed incorrectly.

c) Quality Assurance should be proportional to the significance of getting it wrong, i.e. the consequences of failure.

d) In practical terms, to achieve adequate quality it is essential to have:-

A. The Correct Person

a) The issue of staff competence is wide ranging and covers all aspects of locomotive maintenance and operation, not just boilers. There are continuous developments and changes being considered by the Heritage Railway Association and Office of Rail and Road in respect of such work. Training and development in these areas is subject to changes and renewed understanding.

b) Is it necessary for the person undertaking a particular task to be properly trained?

c) Does that person understand their role and responsibilities to undertake the task?

d) It is necessary to ensure persons working on boilers and for that matter those involved in operating the locomotives are;-

i) Properly trained;

ii) Properly Supervised; and

iii) Can demonstrate adequate competence.

e) For further guidance see Rail Safety Publication RSP 001 ‘Maintaining Staff Competence’ and RSP006 The Management of Steam Locomotive Boilers.

B. Correct Equipment

a) Are the tools for carrying out a task the correct ones? Are they properly identified, and in good order?

b) Is the measuring and inspection equipment in good order?

c) Is it necessary for equipment to be regularly inspected and calibrated?

C. Correct Component /Item

a) Has the boiler or defective item been properly identified?

b) Have changes/modifications been properly identified, approved and fully documented?

c) Does the material to be used on the boiler have traceable records of composition and testing documentation?

d) Is the material in good condition to be used in the repair of the boiler?

D. Correct Information

a) How is information transmitted; e.g. verbal, memory, written?

b) Is the information approved? e.g.. work instruction?

c) Is the content adequate to ensure the task is carried out correctly?

d) Is there any history/information, legal requirements/specialist advice on record regarding the task carried out?

e) What records are produced during and upon the completion of the task? e.g. what material has been used and on what part/location on the boiler? Who carried out the task and what is the competency of that person? Is that competency fully up to date.

E. Verified Tasks

a) Are inspections or testing necessary to prove the task has been carried out satisfactory?

b) Consider other processes that may be more appropriate or necessary - e.g. Double checking, Sampling, Independent assessment, Witness, Audit. Etc.

c) Internal (and external) Audit.

d) Periodical Review.

e) Management of Change.

See appendix A “Management Systems Checklist Requirements Compilation” for a more in depth explanation and examples of the above control measures. These are based on regulatory requirements and quality assessment principles.

11. Documents that are defined as Records:

a) Consider drawing up record inventory; aim for an exhaustive list.

b) Typical items include:

i) Policy Documents; e.g. Maintenance policy;

ii) Procedures and Work Instructions relating to the operation and maintenance of boilers;

iii) Information that relates to Work Control and planning Prompts ie; the scheduling of routine boiler inspections, deferred repairs etc.;

iv) Staff competence training and on-going up to date competency records;

v) Modifications proposal and approval system;

vi) Process Specifications;

vii) Supplier qualification and control;

viii) Boiler operating records;

ix) Drivers report forms. Defect Report Forms ;

x) Boiler repair job sheets recording the defect and the repair details;

xi) Boiler examinations records. These consists typically of:

(1) Boiler inspections - Part 1 Thorough examination and Part 2 Working examination.

(2) Periodic examinations.

(3) ‘Special service’ documentation, specifications and reports (often associated with boiler overhauls, repairs and renewals) provided by the Competent Person Boiler Inspector Inspecting Authority.

12. Storage of Records

a) All records should be stored securely to;-

i) Prevent deterioration of both paper hard copy and computer stored information;

ii) Prevent unauthorised access and possible interference / falsification of records; and

iii) Prevent loss or mislaid records.

b) Records should be duplicated and stored in a diversified storage location so information is not completely lost due to events such as fire/flood etc.

c) Records should be retained as ‘permanent records’ until the boiler they relate to has been scrapped.

13. Identification of boiler

a) Indelibly mark or stamp the boiler with unique identification number (not the locomotive number).

b) All documents should refer to this number.

end of main document

Appendix A: Management Systems Checklist

PERSON

REQUIREMENT	COMMENTS
'**Responsible Person'** terms of reference & duties	
'**Responsible person'** to supervise firebox repairs	Term; 'manage' in RSP006
'**Welder'** properly qualified.	
'Persons' :-	
i) carrying out maintenance work on boilers to be competent for the duty performed.	A suitable combination of qualifications, training & experience.
ii) identified and authorised to carry out maintenance.	
iii) acknowledge and understand their role and responsibilities and limitations.	
iv) have appropriate attributes.	e.g. medically fit to do work / happy to work in confined spaces.
'User (Duty Holder)' :-	
i) to supply adequate training to operate equipment (loco boiler).	
ii) to select and appoint 'Competent Person' and Responsible Person.	Related regulation Provision & Use of Work Equipment Regs.1998 regulation 9.
iii) to assume responsibility for loco exam and maintenance.	

ITEM

REQUIREMENT	COMMENTS
Examination of boiler;-	
i)details	e.g. SWP and date of manufacture.
ii) after lay-up – extra checks	
iii) prepared for -user to ensure	
Operation of boiler details	
Materials used to repair boiler properly chosen and controlled.	
Identification, boiler should be identified. -boiler identified & marked up with information as appropriate to vessel duty	Typical Risk assessment aspects
Condition status, (i.e. is it out of service ?) should be make clear	How will it affect neighbourhood, public relations etc.
Conditions, should they be controlled i.e. ventilation, lighting, low voltage equipment etc.	
Environment, e.g. control of emissions, noise etc.	
Non-conforming items, control of; e.g. faulty material is not accidentally used.	Formalise previous accepted and approved practice.
Alterations; e.g. larger stays.	
Materials:-	Traceability arrangements
i) Arrangements to control;- storage to prevent deterioration, methods of handling to prevent damage	
ii) System to identify where materials have been used and where they have been procured from.	e.g. could copper pipes be overheated when annealing, or boiler tubes over expanded?
Approval and control; identify the processes materials are subjected to.	
Preservation, ensure boiler can be 'held in a good state of preservation' (e.g. while other repairs to loco carried out.)	

EQUIPMENT

REQUIREMENT	COMMENTS
Safety valves. condition status and testing **Pressure test gauge**. calibration **Lead** (for fusible plugs). Purity **Tools** to be properly identified to ensure correct for task, in satisfactory condition for purpose, regularly inspected, available for use. etc **Measuring tools** to be calibrated. **Non-conforming items**, materials and equipment;- arrangements to segregate to prevent their inadvertent use. **Depot facilities**, level of equipment/ capacity of **Inspection**, the use of various techniques	May involve other items of equipment e.g. torque wrenches. e.g. quarantine area, labelling of components / materials. Specification in relation to 'loan' loco's.

INFORMATION

REQUIREMENT	COMMENTS
Guidance & special needs of rail preservation **Identification of risks,** consequences of failure **Risk reduction**, the need for maintenance to reduce risks of danger. **Scope of information** (railway) e.g. locos not owned by operator. Locos above 15" gauge. Locomotive boilers other than traction engines. **Modifications**:- i) change process ii) change check list **Written Scheme**:- i) requirement to have written scheme prepared ii) requirement to have written scheme certified iii) user to define scope of 'written scheme'+ criteria iv) user to ensure 'written scheme' is reviewed v) do not operate system after 'due by' date **System:-** i) routine prompt system to identify maintenance ii) maintenance policy prescribed iii) need for maintenance to reduce risk **Records:-** i) records details; operation and maintenance ii) certificates; analysis, test, conformity iii) welding repair procedure. Iv) welding 'method statements' v) formal records of repair history vi) documentation to travel with loan loco vii) documentation to travel with loco at change of ownership	The suite of Boiler Code of Practice (BCOP) Guidance Notes documentation covers much of the controls and information listed in this document. This is an invaluable starting point reference. imply owner/user responsibility PSSR Reg 9 requires the inspection in accordance with 'written scheme'. PSSR Reg 8 requires 'written scheme' to be reviewed /revised as required by a Competent Person (of suitable qualifications to assess the scheme.)

Design:-	
i) specifications for correct grade of materials and tools established for boiler repairs.	Experience has shown that the management of boiler repairs requires liaison and agreement between boiler inspector (competent person, inspection authority), duty holder and the contractor performing the work.
ii) designers / manufacturers to consider purpose & compliance with regulations	
Methods:-	
i) boiler repair technique to be properly specified.	
ii) boiler repair by contractor to be specified. Include liaison / interfaces	
iii) notices in the work place to remind staff and make clear the shop floor controls are operated in practice.	
iv) maintenance instructions to be available to staff	
v) instructions to give full details inc. Emergency arrangements	This will assist in identifying what is important enough to be controlled and what can be left as verbal or processed as part of personnel competence.
vi) identify what information should be formalised in writing and the type of documents are necessary e.g. work instructions, checklists, notices, procedures, reports, records etc. + the format, content of documents.	Does the recipient understand what you think it means? Is there an arrangement to 'feedback' errors, amendments, and suggestions to encourage any possible improvements?
vii) establish arrangements to control documentation information. e.g. its approval distribution, updating, receipt and understanding.	
viii) records to be retrievable and protected	

VERIFICATION

REQUIREMENT	COMMENTS
Inspection:-	
i) witness of welding tack up / inserts	
ii) inspections by Responsible & Competent persons.	
iii) welding tests	
iv) hydraulic testing pipes and boilers	
v) accumulation test for safety valves	
vi) further tests to assure quality	If problem exists – try to ensure that quality assurance checks use different / additional method.
vii) Identification of inspection points at 'key' stages of the process	Quality cannot be inspected in – it has to be built in at all stages.
Ongoing monitoring:-	
i) consider other approaches to assure quality such as 'in service' inspections of completed work.	
ii) also identify operating problems / vulnerable aspects and incorporate improvements	
iii) reporting of incidents and 'near misses'	
iv) system to learn from the experience of others; both within boiler repair industry and the broader industrial environment	
Audit:-	
i) independent assessment by specialist	
ii) welders approval certificates	
iii) review of processes either internally or by external audit	RM3H is the Risk Management Maturity model recommended by Office of Rail and Road (ORR, the Government regulator) for the heritage sector in keeping with its approach to the national rail industry
iv) user to ensure that boiler inspection has been carried out in a satisfactory manner	Duty of the Responsible Person' see RSP 006.

end of appendices

