NATIONAL TRACTION ENGINE TRUST

Preserving our heritage with steam on the road

ENGINE OWNER'S CODES OF PRACTICE

PART 4

NTET WRITTEN SCHEME OF EXAMINATION

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As applied to the Pressure Systems of Traction Engines and other Steam Driven Road Vehicles with Locomotive Type or Vertical Water/Fire Tube Boilers

4.1 INTRODUCTION

4.1.1 In the United Kingdom all steam generators and *boilers* in commercial use are subject to the *Pressure Systems Safety Regulations 2000*. An Approved Code of Practice, published by the HSE, backs up these Regulations. Whilst these regulations and attendant Code of Practice do not apply to steam driven road vehicles and similar devices NOT in commercial use, it is the policy of the Trust to set standards which equal these statutory requirements.

4.1.2 The *Pressure Systems Safety Regulations 2000* repeal all other legislation relating to the operation and maintenance of steam generators and *boilers*. Importantly they: -

(a) apply to the whole of the *pressure system* (not just the *boiler*) and
(b) require the *owner* to have a written scheme for the periodic examination, by a *competent person*, of every pressure vessel; all it's protective devices and all pipe work and *fittings* in which a defect may give rise to danger.

4.1.3 The Regulations do not fix a set period between examinations but the *NTET* advises that a period not exceeding 14 months be implemented for locomotive type or vertical water/fire tube *boilers*.

4.1.4 A written scheme of examination must:

(a) be drawn up by or be certified by a *competent person*;
(b) specify the extent, nature and frequency of examination and
(c) specify the way in which the *pressure system* is to be prepared for examination.

4.1.5 Although traction engines and similar steam driven road vehicles have *pressure systems*, which are fundamentally the same, their condition varies from the newly rebuilt to the near derelict. It is therefore necessary to have a scheme of examination that will be suitable in all circumstances. See 4.3.2 and 4.4

4.1.6 IT MUST BE EMPHASISED THAT IT IS THE *OWNER'S* RESPONSIBILITY

A) TO HAVE THE BOILER EXAMINED

B) TO APPOINT A *COMPETENT PERSON* TO DRAW UP THE WRITTEN SCHEME OF EXAMINATION

C) TO APPOINT A COMPETENT *BOILER INSPECTOR*

4.2 APPOINTMENT OF A *COMPETENT PERSON*

4.2.1 Every Engine *Owner* shall appoint a *competent person* (from this point on referred to as the *Boiler Inspector*) to carry out regular examinations of the *pressure system* of his or her *engine*(s). Ideally the appointment should be confirmed in writing.

NB *Boiler Inspector* means a person employed as a *Boiler Inspector* or as an Engineer Surveyor by an *Approved Inspecting Organisation* or an independent person who has the necessary qualifications and experience and has the necessary professional indemnity insurance, and has the same meaning as "*competent person*" in PSSR 2000 or "Authorised Inspector" in the Boiler & Pressure Vessels Code of the American Society of Mechanical Engineers

Approved Inspecting Organisation **means a company, association or other body of persons corporate or un-incorporate, which holds a current Certificate of Professional Indemnity Insurance to carry out boiler inspections**

4.3 DOCUMENTATION

4.3.1 The NTET, as a competent body, has drawn up two generic Written Schemes of Examination for application to *locomotive type boiler*s (Scheme A) and to vertical water/fire tube type *boiler*s (Scheme B).

4.3.2 The individual written schemes are derived from detailed System Preparation Schedules and Examination Schedules. Each examination schedule covers 2 main 'classes' of examination; Annual Inspection and Major Repairs. Each provides a framework within which the extent of preparation and examination can be set with regard to the condition of the *pressure system*, the standard of care and maintenance, and storage conditions. Inspections undertaken at re-tubing and hydraulic testing are also included.

4.3.3 For presentation purposes the tasks associated with each examination schedule are integrated into a set of tables arranged under three headings, Preparation, Cold Examination and In-steam Examination. The Schedules are described in the sections below, commencing with 4.4.

4.3.4 The generic Written Schemes of Examination, for which the Safety Assessment Federation (SAFed) has given its approved, are presented as Appendix A. The NTET recommends that 'engine owning members' request their boiler inspector agree to apply the appropriate Scheme to their pressure system(s).

4.3.5 The sets of Examination Report Templates, one set for each Written Scheme Examination Schedule, are presented as Appendix B. The Examination Report Templates are designed to assist both the *Boiler Inspector* and the *Owner*. They include clear descriptions of all of the areas requiring examination and provision for recording the outcome of those examinations. The NTET recommends that 'engine owning members' request that their boiler inspector agree to record the results of examinations on the appropriate forms.

4.4 CLASSES OF EXAMINATION

4.4.1 CLASS A1 (Annual Inspection)

A Class A1 examination would be for a *locomotive type pressure system* which is in reasonably good condition and which is maintained and stored in reasonably good conditions and would be carried out at intervals specified in the Written Scheme and should not exceed 14 months.

4.4.1.1 EXAMINATION AT RE-TUBING

Tubes shall not normally be removed on the basis of time expiry. There must be a compelling reason for tube removal, such as the obvious deterioration of the tubes or where removal of the tubes would provide access to concealed parts of the *boiler*, where it is suspected that deterioration has taken place.

Whilst not a specific requirement, the ideal procedure for examination at re-tubing is that the *Boiler Inspector* should be informed that retubing is to be undertaken.

Arrangements should be made for the *Boiler Inspector* to carry out a thorough examination of the *boiler* (i.e. Cold Examination) reporting on the condition of the parts of the *boiler* previously obscured by the tubes.

It would normally be expected that, at the discretion of the *Owner* and the *Boiler Inspector*, a full 10 year hydraulic test would be carried out and therefore commence a new 10 year period.

Failure to follow the above procedure could result in the new tubes having to be removed at the next cold inspection in order to allow the Inspector to examine the inside of the *boiler*.

4.4.2 CLASS A2 (Major Repairs)

A Class A2 examination would usually be necessary for a *locomotive type pressure system,* which had been derelict, or for one, which is undergoing major repairs. In the case of a *pressure system* undergoing major repairs, examinations of the work should be carried out in accordance with a schedule agreed between the *Owner* and the *Boiler Inspector*.

4.4.2.1 HYDRAULIC TEST

A hydraulic test, when related to a Class A1 Examination should take place at intervals as specified in the Written Scheme and this interval will not exceed 10 years. A hydraulic test should be appended to a Class A2 Examination as required.

4.4.3 CLASS B1 (Annual Inspection)

A Class B1 examination would be for a *water/fire tube type pressure system* which is in reasonably good condition and is maintained and stored in reasonably good conditions and would be carried out at intervals specified in the Written Scheme and should not exceed 14 months.

4.4.3.1 EXAMINATION AT RE-TUBING

Tubes shall not normally be removed on the basis of time expiry. There must be a compelling reason for tube removal, such as the obvious deterioration of the tubes or where removal of the tubes would provide access to concealed parts of the *boiler*, where it is suspected that deterioration has taken place.

Whilst not a specific requirement, the ideal procedure for examination at re-tubing is that the *Boiler Inspector* should be informed that retubing is to be undertaken.

Arrangements should be made for the *Boiler Inspector* to carry out a thorough examination of the *boiler* (i.e. Cold Examination) reporting on the condition of the parts of the *boiler* previously obscured by the tubes.

It would normally be expected that, at the discretion of the *Owner* and the *Boiler Inspector*, a full 10 year hydraulic test would be carried out and therefore commence a new 10 year period.

Failure to follow the above procedure could result in the new tubes having to be removed at the next cold inspection in order to allow the Inspector to examine the inside of the *boiler*.

4.4.4 CLASS B2 (Major Repairs)

A Class B2 examination would usually be necessary for a water/fire tube type *pressure system,* which had been derelict, or for one, which is undergoing major repairs. In the case of a *pressure system* undergoing major repairs, examinations of the work should be carried out in accordance with a schedule agreed between the *Owner* and the *Boiler Inspector*.

4.4.4.1 HYDRAULIC TEST

A hydraulic test, when related to a Class B1 Examination should take place at intervals as specified in the Written Scheme and this interval will not exceed 10 years. A hydraulic test should be appended to a Class B2 Examination as required.

4.5 AGREEMENT AS TO THE CLASS OF EXAMINATION to be carried out on the first occasion

4.5.1 When a new *Boiler Inspector* is appointed a review of any existing scheme and/or existing reports must be undertaken and the scheme agreed.

4.5.2 After examining previous *boiler* examination reports, records of repairs, steaming records and, if he considers it necessary, making a preliminary examination of the *pressure system*, the *Boiler Inspecto*r shall inform the *Owner* what class of examination he considers it necessary to carry out. In making this decision the *Boiler Inspector* should take note of the views of the *Owner*, the standard of general care and maintenance of the *pressure system* and the conditions under which it is stored when not in use.

4.6 SUBSEQUENT EXAMINATIONS

4.6.1 After each examination and after discussion with the *Owner*, the *Boiler Inspector* shall, when making his written report, specify the class of examination that he considers should be carried out on the next occasion.

4.7 FREQUENCY OF EXAMINATION

4.7.1 After each examination the *Boiler Inspector* shall specify in writing the period within which the next examination shall be carried out. This period may be 14 months but, depending upon the conditions prevailing, the *Boiler Inspector* may specify a shorter interval.

4.8 FURTHER EXAMINATION

4.8.1 If, during the course of a planned examination, the *Boiler Inspector* discovers defects which could not reasonably have been anticipated he may, after consultation with the *Owner*, require such further dismantling as may be necessary to enable him to establish the true condition of the *pressure system*. It must be clearly understood that the *Owner* bears the ultimate responsibility for the *pressure system*, but the *Boiler Inspector* must be given every co-operation in carrying out his task, otherwise it will not be possible for him to complete his examination.

4.9 EXAMINATIONS IN STEAM

4.9.1 The NTET strongly advises that 'In Steam' Examinations MUST NOT be conducted at any place where the public are present. The Public Liability aspect of the *engine*'s insurance policy may be suspended until the issuing of the inspectors report giving permission for continued steaming.

4.10 FACILITIES FOR THE *BOILER INSPECTOR*

4.10.1 Before the *Boiler Inspector* is due to carry out an examination the *pressure system* should, if possible, be parked under cover on a dry floor. Any ashes, soot, dirt or puddles of water should be cleared away. If the bottom of the firebox is close to the ground, it is helpful to run the back wheels of the *engine* up on to timbers to make

access to the firebox reasonably easy. If mains electricity is available, a lead lamp, in good condition and preferably at a transformed low voltage (110V centre tapped), should also be provided.

4.10.2 The Written Scheme of Examination, steaming records, records of maintenance and minor repairs, kept in accordance with Part 8 of this Code, together with the reports of previous examinations must be available for examination by the *Boiler Inspector*.

4.11 ADOPTION OF THE NTET SCHEME OF EXAMINATION and INSPECTION TEMPLATE

4.11.1 The Engine *Owner* and the *Boiler Inspector* should jointly produce a Written Scheme of Examination, preferably based upon the NTET's Scheme of Examination (Appendix A).

4.11.2 The Written Scheme of Examination must be clearly set out in writing, signed by the *Owner* and certified by a *competent person* as suitable for that *pressure system*.

4.11.3 An *Owner* intending to apply for an *NTET* Insurance Disc should preferably request that the *Boiler Inspector* records the outcome of any examination using the NTET's Boiler Examination Report templates (Appendix B) or a report format that has been approved by *SAFed* or *UKAS*.

4.12 TYPICAL EXAMINATION SCHEDULES

4.12.1 Schedule A - FOR ENGINES WITH LOCOMOTIVE TYPE BOILERS

Table 1 - PREPARATION, Locomotive Type Boilers

Task	Description	A1	A2
P1	Drain boiler	X	X
P2	Remove doors	X	X
P3	Remove washout plugs	X	X
P4	Washout water space	X	X
P5	Remove ash pan and firebars	X	X
P6	Clean firebox	X	X
P7	Clean tubes	X	X
P8	Clean smoke box	X	X
P9	Remove fusible plug	X	X
P10	Clean external fittings	X	X
P11	Remove pressure gauge	X	X
P12	Clean external surfaces and de-scale where necessary	X	X
P13	Remove superheater		X
P14	Remove refractory brickwork		X
P15	Clean and de-scale water spaces		X
P16	Remove sample tube – if requested	X	
P17*	Remove tubes		X
P18*	Remove all fittings attached to boiler and dismantle as required	X	X
P19*	Open up safety valves, feed check valves and water gauge fittings	X	X
P20*	Remove safety valves	X	X
P21*	Dismantle safety valves	X	X
P22	Anneal copper pipes		X
P23	Remove lagging		X
P24	Remove cylinder block if required		X

* If so directed by the Boiler Inspector

4.12.2 Notes for Table 1

P1 Drain the *boiler*

P2, P3 Remove all doors and washout plugs (these should be permanently marked to ensure that they go back into the same openings).

SAFETY NOTE: Any joints or gaskets which are to be discarded and are made of, or contain asbestos, should be thoroughly soaked with water before removal and then placed in a strong plastic bag, sealed, marked and disposed of in a safe manner.

P4 Wash out the water spaces and remove all loose scale and sludge.

P5 Remove the ashpan and firebars.

P6, P7, P8 Thoroughly clean the fire side of the firebox, tubes and smokebox.

P9 Remove and clean the fusible plug(s).

P10 Remove any mud, dirt and loose scale from the *boiler* fittings and external surfaces of the *boiler* and other parts of the pressure system, where accessible, sufficiently to facilitate examination.

P11 Remove pressure gauge. The pressure gauge may be sent complete to competent repairers, nominated by the *Owner* and agreed by the *Boiler Inspector*, for overhaul and calibration.

P12 Clean external surfaces and de-scale where necessary the *boiler* and pipe work (but do not paint until after the examination).

P13 Remove any superheater elements and headers.

P14 Remove any refractory brickwork.

P15 So far as practicable, thoroughly descale and clean all parts of the water side of the *boiler*.

P16 If so requested by the *Boiler Inspector*, remove a sample tube or tubes as specified and put them aside for examination.

P17 Remove all tubes.

P18 If so requested by the *Boiler Inspector*, remove or release all or any of the *fittings* directly attached to the *boiler*, for *examination* of the securing bolts, studs or screw threads in the *boiler* shell.

P19 Open-up safety valves, feed check valves and *water gauge* fittings

P20 Remove safety valves

P21 Dismantle safety valves as directed by the *Boiler Inspector* and set them aside for examination. If preferred, the safety valve(s) may be sent complete to a competent repairer, nominated by the *Owner* and agreed by the *Boiler Inspector*, for overhaul and setting.

Note: *great care should be taken to ensure that the parts of dismantled fittings do not get mixed-up. The safest course is to have sufficient boxes or tins, so that the parts of each fitting can be placed in a separate container*.

P22 Anneal copper pipes forming part of the *pressure system*.

P23 Remove all external lagging.

SAFETY NOTE: Unless it is positively known that the lagging does not contain any asbestos, removal of the cladding sheets should be carried out with the greatest care. If any sort of powdery, fibrous material is found, removal should stop and the cladding be replaced sufficiently to keep the material in place until expert advice has been obtained. Any asbestos cord or tape used for insulating pipes or valves should be treated similarly unless there is only a very small quantity, in which case it may be thoroughly soaked with water, carefully unwound, placed in a strong plastic bag, sealed, marked and disposed of in a safe manner.

After examination, the *boiler* and any pipe work should be re-lagged with non-toxic materials and a note to this effect made in the *Engine* Records.

P24 If the *Boiler Inspector* has reason to believe that there is substantial deterioration of the *boiler* shell beneath the cylinder block, motion brackets or other parts not normally removed for thorough examination or of the bolts or studs by which they are secured to the *boiler*, he may require their removal.

Table 2 - EXAMINATION WHEN COLD, Locomotive Type Boilers

Task	Description	A1	A2
C1	Visually examine boiler, internally and externally where accessible	X	X
C2	Examine fusible plugs	X	X
C3	Hammer test stays and all accessible parts of the boiler	X	X
C4	Examine for signs of steam and water leaks	X	X
C5	Check water gauge test cock passages	X	X
C6	Examine water gauge cocks, test cocks and blowdown valves	X	X
C7	Check gauge glasses	X	X
C8	Check gauge glass protectors	X	X
C9	Examine manhole and mudhole doors and bridges	X	X
C10	Examine washout plugs and holes	X	X
C11	Check pressure gauge	X	X
C12	Examine safety valves and springs	X	X
C13	Examine feed check valves	X	X
C14	Check all fittings directly attached to the boiler	X	X
C15	Check and examine as necessary all pipe work carrying steam or hot water under pressure	X	X
C16	Examine blastpipe	X	X
C17	Examine piston and valve rod glands	X	X
C18	Hammer test parts made accessible by removal of fittings	X	X
C19	Visually examine all other parts of the pressure system	X	X
C20	Further examination, by other means any part of the pressure system as required by the Boiler Inspector	X	X
C21	Check non-ferrous fittings for signs of deterioration		X
C22	Examine by other means all parts of the pressure system known to be subject to cracking or other non-visible defects		X
C23	Examine smokebox		X
C24	Removal of sample tube and follow up		X
C25	Examine tube plates and water spaces		X
C26	Hydraulic test		X

4.12.3 Notes for Table 2

C1 Visually examine the boiler internally and externally where accessible.

C2 Examine *fusible plug*(s). Check for corrosion/ erosion of lead and ensure there is no visible sign of extrusion of the lead through its carrier. *Fusible plug*s should have threads of correct form and engage over the full thickness of plate or opening. Where wastage of plate has occurred the number of full threads in engagement may well determine the extent of renewal or repair. Where threads are damaged the hole may need to be re-tapped and an oversize plug fitted.

C3 Hammer test stays.

C4 Examine for signs of steam or water leaks, particularly at the manhole and mudholes and flange joints.

C5 Check *water gauge* test cock passages by removing the blanking stud and inserting a rod of suitable diameter to ensure that the passage is clear into the steam and water space of the *boiler*.

C6 Examine *water gauge* cocks, test cocks and *blowdown valve*s for signs of leakage and check for free operation. On *blowdown* or other taper plug valves/cocks particular attention should be given to the condition of the backnut and thread and/or gland nuts and studs, which retain the plug. Where alignment of the hole in the plug is critical (Water level gauges) or is indicated by a marked line, this should be checked to ensure that there is no distortion of the operating handle or square for key or spanner operation.

C7 Check gauge glass(es) for correct alignment, absence of leakage and for glass erosion at the ends.

C8 Check that gauge glass protector(s) are of suitable type, in good condition and properly fitted.

C9 Visually examine the manhole and mudhole doors and bridges for damage, wastage, cracks, damaged or wasted threads, and correct fit in the *boiler* in their respective openings. All nuts and studs on mud doors and inspection doors should be physically checked for fit and full depth of thread engagement. Studs and nuts that are wasted, worn, distorted or overstrained should be renewed. Bridges or dogs should be free from distortion and should bed closely at the outer end with the shell or ring. The nut should seat squarely on the faced area, compressing the joint evenly all round when load is applied. The door joint face, inside joint seating and surrounding area should be examined for signs of previous leakage and wasting. The door should be visibly checked with the door joint in position to ensure that the locating spigot (a) projects well above the joint to locate the door when fitting (b) fits the opening within the limits specified in Part 6.8.8 (repair of mudhole/inspection doors).

C10 Examine washout plugs and holes for worn or damaged threads. Washout plugs should have threads of correct form and engage over the full thickness of plate or opening. Where wastage of plate has occurred the number of full threads in engagement may well determine the extent of renewal or repair. Where threads are damaged the hole may need to be re-tapped and an oversize plug fitted.

C11 Check pressure gauge, particular attention should be paid to damage from frost. If suitable equipment is available, the pressure gauge may be verified during the cold examination. Periodically the pressure gauge should be calibrated against a standard instrument.

C12 Examine safety valve(s) for proper seating and safety valve spring(s) for corrosion or other signs of deterioration.

C13 Examine feed check valve(s) for proper seating. On taper plug valves/cocks particular attention should be given to the condition of the backnut and thread and/or gland nuts and studs, which retain the plug. Where alignment of the hole in the plug is critical or is indicated by a marked line, this should be checked to ensure that there is no distortion of the operating handle or square for key or spanner operation.

C14 Examine all fittings directly attached to the *boiler* for signs of deterioration including the securing bolts or studs. Where directly attached fittings have been removed or released, examine the securing studs or bolts. Wasted, worn or over stressed studs should be renewed.

C15 Check and examine as necessary, all pipe work carrying steam or hot water under pressure for signs of damage, cracking or leakage.

C16 Examine the blast pipe for wasting or fracture likely to lead to the discharge of condensate onto the *boiler* shell.

C17 Examine the piston and valve rod glands for signs of leakage, where this could lead to the discharge of condensate onto the *boiler* shell.

C18 Visually examine and hammer test as necessary all accessible parts of the *boiler*, paying particular attention to the parts made accessible by the removal of *fittings*, lagging, refractory brickwork, superheater elements and headers, sample tubes and the area of the tube plates and other tubes exposed by their removal.

C19 Visually examine all other parts of the *pressure system* paying particular attention to all parts of dismantled *fittings* and the studs or bolts by which they are attached to the *boiler*. Wasted, worn or over stressed studs should be renewed.

C20 Further examination of all or any parts of the *pressure system* may be required as considered necessary by the *Boiler Inspector.*

C21 Check for signs of embrittlement and/or dezincification in non-ferrous *fittings*. All fittings should be carefully examined to check for mechanical or frost damage.

C22 Examine by ultrasonic, magnetic particle, dye penetrant, radiographic or other appropriate means, all parts of the *pressure system* known to be subject to cracking or other non-visible defects. If doubt still remains as to the adequate thickness of any part of the *boiler* plates, test drillings may be made as necessary.

C23 The opportunity should be taken to examine the smokebox for signs of deterioration, particularly where it is attached to the *boiler* and in the region of the perch bracket (or mounting for the front roll forks) and chimney base. (Failure of the smokebox could lead to severe shock loads being applied to the *boiler*.)

C24 If examination of those parts of the *boiler* shell and tube plates made accessible by the removal of a sample tube or tubes indicates that there may be serious deterioration of those parts still not accessible, the *Boiler Inspector* may require the removal of all or any of the remaining tubes as necessary.

Note: If the results of the examinations carried out in accordance with the above paragraphs do not satisfy the *Boiler Inspector* as to the condition of the *pressure system* he may, upon

stating his reasons to the *owner*, require a hydraulic test, in accordance with part 4.13, of all or part of the *pressure system* after reassembly and before the system is steamed.

C25 Visually examine and hammer test as necessary all accessible parts, paying particular attention to the tube plates, lower part of the barrel, throat plate area, firebox sides and stays, and any other parts normally obscured by the tubes. Examine by ultrasonic, magnetic particle, dye penetrant, radiographic or other appropriate means all or any of the foregoing parts as considered necessary.

Note: An hydraulic test to 10% or 20 pounds per square inch (whichever is the greater) above the working pressure may be carried-out as a means of testing the tightness of the new tubes after fitting but this does not constitute a full hydraulic test.

C26 A hydraulic test, in accordance with Part 4.13, of the whole *pressure system* (except the pressure gauge and safety valves), after reassembly and before the system is steamed.

Table 3 - EXAMINATION IN STEAM, Locomotive Type Boilers

Note 1: The examination in steam should be carried out as soon after the cold examination as is reasonably practicable and **before** the *pressure system* is steamed on the public roads or at any *public event*. **It should be noted that once a 'Cold Examination' has taken place the Boiler Explosion Insurance may become invalid and only Public Liability Insurance can be in place to cover the *Owner*/operator steaming the *boiler* in private for initial test purposes and the 'Steam Test'.**

Note 2: The same *Boiler Inspector* need not carry out the examinations when cold and in steam but the examination in steam may not be carried out by a different *Boiler Inspector* unless the report of the cold examination (or a copy) has been produced to him.

Task	Description	A1	A2
S1	Check for steam or water leaks	X	X
S2	Check all steam and water valves	X	X
S3	Check water gauge(s)	X	X
S4	Check gauge glass protectors	X	X
S5	Check test cocks (if fitted)	X	X
S6	Check blowdown valve(s)	X	X
S7	Check pressure gauge	X	X
S8	Check pressure gauge is marked at safe working pressure	X	X
S9	Check safety valves	X	X
S10	Check injector(s) and/or water feed pump	X	X
S11	Check regulator	X	X
S12	Check cylinder drain cocks	X	X
S13	Check piston and valve rod glands	X	X
S14	Check damper	X	X
S15	Examine tube ends, as far as is practicable	X	X
S16	Visually examine tube plate for leaks	X	X
S17	Check wash out plugs and fusible plugs (where practicable)	X	X
S18	In Steam test to be carried out before the boiler lagging is replaced		X

4.12.4 Notes for Table 3

S1 Check for steam or water leaks anywhere on the *pressure system*

S2 Check all steam and water valves for free operation, full shut off and absence of leaks from glands.

S3 Check *water gauge*(s) using gauge *blowdown* procedure

1. Close the top steam cock and bottom water cock.

2. Open the column drain cock; the water should disappear from the glass. Check, after a few moments that water and/or steam do not continue to discharge from the drain pipe; if they do, it means that the steam and/or water cocks are not shutting off properly.
3. Keeping the drain cock open and the steam cock shut open the bottom water cock; water & steam should discharge vigorously from the drain pipe. Re-close the water cock.
4. Keeping the drain cock open and the water cock shut open the top steam cock; steam should discharge vigorously from the drain pipe.
5. Close the drain cock and check that water does not rise into the glass.
6. Open the bottom cock. The water should rise in the glass without hesitation.

S4 Check that the gauge glass protectors are in position and in good condition

S5 Check test cocks (if fitted)

S6 Check *blowdown valve*(s) for correct operation. This should initially be carried out at low pressure, not exceeding 50psi.

S7 Unless the accuracy of the pressure gauge has been verified during the cold examination, with a test gauge fitted, check pressure gauge.

S8 Check that the pressure gauge is correctly marked at the *safe working pressure*.

S9 Check safety valve(s) for correct setting and operation. Safety valves should always start to release steam at the maximum permitted working pressure as stated in the Written Scheme of Examination and should be capable of discharging all the steam that the *boiler* can generate at a pressure not exceeding 10% above the maximum permitted working pressure, per BS 5500. On falling or 'Blowdown' pressure they should shut off steam tight just below working pressure. A slight wisp of escaping steam is not detrimental. Safety valves, which are fitted with a lifting device, should be tested regularly to ensure that they lift freely and shut off correctly.

S10 Check injector and/or feed water pump for correct operation.

S11 With the cylinder drain cocks open; check that steam does not blow through the regulator when closed.

S12 Check cylinder drain cocks for correct operation

S13 Check piston and valve rod glands for excessive leakage, particularly where this would lead to the discharge of condensate onto the *boiler* shell.

S14 Check damper(s) and controls for correct operation

S15 So far as practicable, visually examine the tube ends to ensure that they have been correctly expanded and (if appropriate) beaded.

S16 Visually examine for leaks at the tube plates.

S17 Check wash out plugs and where practicable, fusible plug(s).

S18 The *Boiler Inspector* may specify that the examination shall be carried out before replacement of any external lagging.

4.12.5 Schedule B - For Vehicles with Vertical `Water/Fire Tube Boilers

Table 4 – PREPARATION, Water/Fire Tube Boilers

Task	Description	B1	B2
P1	Drain the boiler	X	X
P2	Remove all doors	X	X
P3	Remove washout plugs	X	X
P4	Wash out water spaces	X	X
P5	Remove ashpan and firegrates	X	X
P6	Remove superheater		X
P7	Clean fire side	X	X
P8	Remove fusible plug(s)	X	X
P9	Clean external surfaces	X	X
P10	Pressure gauge	X	X
P11*	Safety valves	X	X
P12	Dismantle pipe work		X
P13	Remove firebox		X
P14	Expose water surfaces		X
P15	Descale water side		X
P16	Remove boiler fittings		X
P17	Remove lagging		X
P18	Remove boiler		X
P19	Descale external surfaces		X
P20	Anneal copper pipe work		X
P21	Remove all pressure pipe work		X
P22	Remove Tubes		X

* If so directed by the Boiler Inspector

4.12.6 Notes for Table 4

P1 Drain the *boiler*

P2, P3 Remove all doors and washout plugs (these should be marked to ensure that they go back into the same openings).

SAFETY NOTE: Any joints or gaskets which are to be discarded and are made of, or contain asbestos, should be thoroughly soaked with water before removal and then placed in a strong plastic bag, sealed, marked and disposed of in a safe manner.

P4 Wash out the water spaces and remove all loose scale and sludge.

P5 Remove the ashpan and fire grates.

P6 If requested by the *Boiler Inspector* remove the superheater assembly.

P7 Thoroughly clean the fire side of the firebox and tubes.

P8 Remove the *fusible plug*(s).

P9 Remove any mud, dirt and loose scale from the *boiler fittings* and external surfaces of the *boiler* and other parts of the *pressure system*, where accessible, sufficiently to facilitate examination.

P10 Pressure gauge may be sent complete to competent repairers, nominated by the *owner* and agreed by the *Boiler Inspector*, for overhaul and calibration.

P11 Safety valve(s) may be sent complete to competent repairers, nominated by the *owner* and agreed by the Boiler Inspector, for overhaul and setting.

P12 Dismantle other pipe work as directed by the *Boiler Inspector*, remove its' lagging and set aside for examination.

Note: After examination the *boiler* and any pipe work should be re-lagged with non-toxic materials and a note to this effect be made in the *engine* records

P13 For *boiler*s with removable fireboxes, remove the firebox.

P14 For other water tube *boiler*s, expose the combustion and water surfaces as far as construction permits

P15 As far as is reasonably practicable, thoroughly descale and clean all parts of the water side of the *boiler*.

P16 Remove and dismantle or open up, as required by the *Boiler Inspector*, all *fittings* directly attached to the *boiler* and set them aside for examination.

Note: Great care should be taken to ensure that the parts of dismantled *fittings* do not get mixed up. The safest course is to have sufficient boxes or tins, so that the parts of each fitting can be placed in a separate container.

P17 If requested by the *Boiler Inspector*, remove all external lagging and thoroughly clean all external surfaces thus exposed (but do not paint until after the examination).

SAFETY NOTE: Unless it is positively known that the lagging does not contain any asbestos, removal of the cladding sheets should be carried out with the greatest of care. If any sort of powdery fibrous material is found, removal should stop and the cladding be replaced sufficiently to keep the material in place until expert advice has been obtained. Any asbestos cord or tape used for insulating pipes or valves should be treated similarly unless there is only a very small quantity in which case it may be thoroughly soaked with water, carefully unwound, placed in a strong plastic bag, sealed, marked and disposed of in a safe manner.

P18 Remove the *boiler* from the vehicle and remove or expose the firebox.

P19 Descale and thoroughly clean all external surfaces of the *boiler* (but do not paint until after the *boiler* has been examined).

P20 Remove and anneal copper pipe work forming part of the *pressure system*.

P21 Remove all pressure pipe work between the *boiler* and the *engine*; remove its lagging and set the pipe work aside for examination.

P22 Remove all tubes.

Table 5 - EXAMINATION WHEN COLD, Water/Fire Tube Boilers

Task	Description	B1	B2
C1	Visually examine boiler internally and externally	X	X
C2	Examine fusible plugs	X	X
C3	Visually examine and hammer test boiler	X	X
C4	Examine for water and steam leaks	X	X
C5	Check water gauge test cock passages	X	X
C6	Examine water gauge cocks, test cocks and blow down valves	X	X
C7	Examine gauge glasses	X	X
C8	Examine gauge glass protectors	X	X
C9	Examine inspection doors	X	X
C10	Examine washout plugs and holes	X	X
C11	Check pressure gauge	X	X
C12	Examine safety valves and springs	X	X
C13	Examine feed check valves	X	X
C14	Check all fittings directly attached to the boiler	X	X
C15	Check and examine as necessary all pipe work carrying steam or hot water under pressure	X	X
C16	Examine regulator block	X	X
C17	Hammer test parts made accessible by removal of fittings	X	X
C18	Visually examine all other parts of the pressure system	X	X
C19	Further examination, by other means any part of the *pressure system* as required by the *Boiler Inspector*	X	X
C20	Examine firebox securing bolts	X	X
C21	Check for signs of deterioration in non-ferrous fittings		X
C22	Examine by other means all parts of the pressure system known to be subject to cracking or other non-visible defects		X
C23	Hydraulic test		X

4.12.7 Notes for Table 5

C1 Visually examine the *boiler* internally and externally where accessible.

C2 Examine the *fusible plug*(s). Check for corrosion/ erosion of lead and ensure there is no visible sign of extrusion of the lead through its carrier. *Fusible plug*s should have threads of correct form and engage over the full thickness of plate or opening. Where wastage of plate has occurred the number of full

threads in engagement may well determine the extent of renewal or repair. Where threads are damaged the hole may need to be re-tapped and an oversize plug fitted.

C3 Visually examine and hammer test as necessary all accessible parts of the *boiler*, paying particular attention to the parts made accessible by the removal of *fittings*, lagging, firebox, superheater assembly and the area of the tube nest. .

C4 Examine for signs of steam or water leaks, particularly at manholes, drain and washout plugs and flange joints.

C5 Check *water gauge* test cock passages by removing the blanking stud and inserting a rod of suitable diameter to ensure that the passage is clear into the steam water space of the *boiler*.

C6 Examine *water gauge* cocks, test cocks and blow down valves for signs of leakage and check for free operation. On *blowdown* or other taper plug valves/cocks particular attention should be given to the condition of the backnut and thread and/or gland nuts and studs, which retain the plug. Where alignment of the hole in the plug is critical (*water gauge*s) or is indicated by a marked line, this should be checked to ensure that there is no distortion of the operating handle or square for key or spanner operation.

C7 Check gauge glass(es) for correct alignment, absence of leakage and for glass erosion at the ends.

C8 Check that the gauge glass protector(s) is of suitable type, in good condition and properly fitted.

C9 Visually examine the access doors and bridges for damage, wastage, cracks, damaged or wasted threads, and correct fit in the *boiler*. All nuts and studs on access and inspection doors should be physically checked for fit and full depth of thread engagement. Studs and nuts that are wasted, worn, distorted or overstrained should be renewed. Bridges or dogs should be free from distortion and should bed closely at the outer end with the shell or ring. The nut should seat squarely on the faced area, compressing the joint evenly all round when load is applied. The door joint face, inside joint seating and surrounding area should be examined for signs of previous leakage and wasting. The door should be visibly checked with a new door joint in position to ensure that the locating spigot (a) projects well above the new joint to locate the door when fitting (b) fits the opening within the limits specified in Part 6.8.8 (repair of mudhole/inspection doors).

C10 Examine washout plugs. Washout plugs should have threads of correct form and engage over the full thickness of plate or opening. Where wastage of plate has occurred the number of full threads in engagement may well determine the extent of renewal or repair. Where threads are damaged the hole may need to be re-tapped and an oversize plug fitted.

C11 Check pressure gauge, particular attention should be paid to damage from frost. If suitable equipment is available, the pressure gauge may be verified during the cold examination. Periodically the pressure gauge should be calibrated against a standard instrument.

C12 Examine safety valve(s) for proper seating and safety valve spring(s) for corrosion or other signs of deterioration.

C13 Examine feed check valve(s) for proper seating. On taper plug valves/cocks particular attention should be given to the condition of the backnut and thread

and/or gland nuts and studs, which retain the plug. Where alignment of the hole in the plug is critical or is indicated by a marked line, this should be checked to ensure that there is no distortion of the operating handle or square for key or spanner operation.

C14 Examine all *fittings* directly attached to the *boiler* for signs of deterioration including the securing bolts or studs. Where directly attached *fittings* have been removed or released, examine the securing studs or bolts. Wasted, worn or over stressed studs should be renewed.

C15 Check and examine as necessary, all pipe work carrying steam or hot water under pressure for signs of damage, cracking or leakage.

C16 Examine regulator block, for signs of leakage and check for free operation

C17 Visually examine and hammer test as necessary all accessible parts of the *boiler*, paying particular attention to the parts made accessible by the removal of *fittings*, lagging, refractory brickwork, superheater elements and headers, sample tubes and the area of the tube plates and other tubes exposed by their removal

C18 Visually examine all other parts of the *pressure system* paying particular attention to all parts of dismantled *fittings* and the studs or bolts by which they are attached to the *boiler*. Wasted, worn or over stressed studs should be renewed.

C19 Further examination of all or any parts of the *pressure system* may be required as considered necessary by the *Boiler Inspector.*

C20 Examine the firebox securing bolts or studs for signs of corrosion, fatigue, cracking or other defects.

C21 Check for signs of embrittlement and/or dezincification in non-ferrous *fittings*. All fittings should be carefully examined to check for mechanical or frost damage.

C22 Examine by ultrasonic, magnetic particle, dye penetrant, radiographic or other appropriate means, all parts of the *pressure system* known to be subject to cracking or other non-visible defects. If doubt still remains as to the adequate thickness of any part of the *boiler* plates, test drillings may be made as necessary.

C23 A hydraulic test in accordance with the table in Part 4.13, of the whole *pressure system* (except the pressure gauge and safety valves), after reassembly and before the system is steamed.

Table 6 - EXAMINATION IN STEAM, Water/Fire Tube Boilers

Note 1: The examination in steam should be carried out as soon after the cold examination as is reasonably practicable and **before** the *pressure system* is steamed on the public roads or at any *public event*. **It should be noted that once a 'Cold Examination' has taken place the Boiler Explosion Insurance may become invalid and only Public Liability Insurance can be in place to cover the *Owner*/operator steaming the *boiler* in private for initial test purposes and the 'Steam Test'.**

Note 2: The same *Boiler Inspector* need not carry out the examinations when cold and in steam but the examination in steam may not be carried out by a different *Boiler Inspector* unless the report of the cold examination (or a copy) has been produced to him.

Task	Description	B1	B2
S1	Check for steam and water leaks	X	X
S2	Check all steam and water valves	X	X
S3	Check water gauge(s)	X	X
S4	Check gauge glass protectors	X	X
S5	Check test cocks (if fitted)	X	X
S6	Check blowdown valve(s)	X	X
S7	Check pressure gauge	X	X
S8	Check pressure gauge correctly marked with safe working pressure	X	X
S9	Check safety valves	X	X
S10	Check injector and /or pump	X	X
S11	Check regulator	X	X
S12	Check ash pan controls	X	X
S13	Check wash out plugs and fusible plugs (where practicable)	X	X
S14	In Steam test to be carried out before boiler lagging is replaced		X

4.12.8 Notes for Table 6

S1 Check for steam or water leaks anywhere on the *pressure system*, including the superheater assembly, where visible.

S2 Check all steam and water valves for free operation, full shut off and absence of leaks from glands.

S3 Check *water gauge*s using gauge *blowdown* procedure.

1 Close the top steam cock and bottom water cock.
2 Open the column drain cock; the water should disappear from the glass. Check, after a few moments that water and/or steam do not continue to

discharge from the drain pipe; if they do, it means that the steam and/or water cocks are not shutting off properly.

3 Keeping the drain cock open and the steam cock shut open the bottom water cock; water & steam should discharge vigorously from the drain pipe. Re-close the water cock.

4 Keeping the drain cock open and the water cock shut open the top steam cock; steam should discharge vigorously from the drain pipe.

5 Close the drain cock and check that water does not rise into the glass.

6 Open the bottom cock. The water should rise in the glass without hesitation.

S4 Check that the gauge glass protectors are in position and in good condition.

S5 Check test cocks (if fitted)

S6 Check *blowdown valve*(s) for correct operation. This should initially be carried out at low pressure, not exceeding 50psi.

S7 Unless the accuracy of the pressure gauge has been verified during the cold examination, with a test gauge fitted, check the pressure gauge.

S8 Check that the pressure gauge is correctly marked at the *safe working pressure*.

S9 Check the safety valve(s) for correct operation and blow-off at the correct pressure. Safety valves should always start to release steam at the prescribed working pressure and should be capable of discharging all the steam, which, the *boiler* can generate, at a pressure not exceeding 10% above the maximum permitted working pressure. On falling pressure they should shut off steam tight just below working pressure. A slight wisp of escaping steam is not detrimental. Safety valves, which are fitted with a lifting device, should be tested regularly to ensure that they lift freely and shut off correctly. Same here regarding 1.6.3.1

S10 Check the injector and/or feed water pump for correct operation.

S11 Check the regulator. With the cylinder drain cocks open (if fitted); check that steam does not blow through the regulator when closed.

S12 Check ashpan controls for correct operation.

S13 Check wash out plugs and where practicable, fusible plug(s).

S14 The *Boiler Inspector* may specify that the examination shall be carried out before replacement of any external lagging.

4.13 HYDRAULIC TESTING

4.13.1 Sound practice dictates that all riveted seams should be exposed for examination and a hydraulic test applied. This should normally be carried out every 7 years. This period may be extended to 10 years at the discretion of the *Boiler Inspector* if the *pressure system* has been stored in reasonably dry conditions i.e. undercover or adequately sheeted to prevent rain access to the lagging. In exceptional circumstances, after a Competent Authoritative Review, the *Competent Person* may agree a longer period, provided that this extended period is recorded in the Written Scheme of Examination and on the Boiler Examination Report, together with the reasons for the extended period.

4.13.2 A hydraulic test to 1.5 times the *boiler* design pressure should also be applied on completion of structural repairs. Structural repairs may be defined as replacement of parts (new firebox), re riveting, patch repairs and building up areas of wasted plate stay replacement. Caulking and tube expansion operations are not regarded as structural repairs and should be tested as directed by the *competent person*.

4.13.3 The lagging should normally be removed in order to complete a satisfactory hydraulic test. However, by written agreement between the *Boiler Inspector* and the *Owner* and after a Competent Authoritative Review the test may be conducted with the lagging in place. If this occurs, it must be recorded on the Boiler Examination Report, and the reasons stated.

4.13.4 The pressure applied as a hydraulic test should be 1.5 times the design pressure of the *pressure system*. **Pressures in excess of 1.5 times the design pressure MUST NOT be applied unless there are very compelling reasons, which must be given in writing to the *owner* before the test is carried out.**

NOTE: Any pressure greater than 1.5 times the design pressure of the *boiler* could permanently deform the structure of the *boiler*.

4.13.5 Under certain circumstances the hydraulic test may be conducted at a lower pressure than 1.5 times the working pressure in order to prove tubes, *fittings* or stays. Tests below 1.5 times the working pressure should be recorded on the formal report of examination in addition to the tests at 1.5 times the design pressure. The water temperature and the ambient temperature shall be no less than 7 degrees centigrade

NOTE: COMPETENT AUTHORITIVE REVIEW

A Competent Authorative Review is one which is based on the principles laid out in “Best practice for risk based inspection as part of plant integrity management,” published by the Health and Safety Executive as Contract Research Report 363/2001.

In summary:
The Authoritative Technical Review systematically assesses the risk of equipment with the intention of extending the periodicity of inspection, in accordance with PSSR 2000.

The report, produced by both the User/Operator of the system and the *Competent Person* responsible for carrying out the routine inspection of the system, gives details of the review carried out of, what is considered to be, all the relevant factors related to the safety of the system. This includes, but is not limited to, a review of (i) the design documentation (ii) the inspection history and (iii) the operational and maintenance history.

4.13.6 Subject to the above the actual pressure to be applied in a hydraulic test must always be a matter for the *Boiler Inspector*, after consultation with the *Owner*. The following table is provided for guidance: -

All Pressures in Lbs. per sq. inch

Design Pressure	Design Pressure x 1.50
40	60
50	75
60	90
70	105
80	120
90	135
100	150
110	165
120	180
130	195
140	210
150	225
160	240
170	255
180	270
190	285
200	300
210	315
220	330
230	345
240	360
250	375
260	390

4.13.7 The test pressure should normally be held for at least thirty minutes to allow for close examination and to detect any leaks. Subject to the agreement of the *Boiler Inspector*, minor loss of pressure (as from a weeping closed valve) may be made up during the test, but the test will be invalidated by any major pressure loss, the cause of which must be found and rectified before repeating the test.

4.13.8 During the period of the hydraulic test, the *boiler* plates shall be checked for deformation, and there shall be no permanent deformation after releasing the hydraulic pressure.

PART 4

NTET WRITTEN SCHEME OF EXAMINATION

APPENDIX A - SAFed Approved WSE's

A1 - Locomotive Type Boiler

A2 - Vertical Water/Fire Tube Boiler

National Traction Engine Trust

PRESSURE SYSTEMS SAFETY REGULATIONS 2000

WRITTEN SCHEME OF EXAMINATION

FOR APPLICATION TO A

LOCOMOTIVE TYPE BOILER

SCHEME REF: | Prepared by:

Make and Type of Engine

Maker's Number & I.D. Marks:

Description of System: ***Locomotive type boiler with protective devices***

Year of Manufacture

Owner:		User	
Owners Address		Address at which the System is normally located	

PRESSURE VESSEL & ASSOCIATED DEVICES – MANUFACTURERS DETAILS AND SERIAL NUMBERS

Boiler:					
Safety Valve(s):					
Pressure Gauge:		*0 -*	PSI	*0 -*	Bar
Water Gauge 1:					
Water Gauge 2;					
Fusible Plug(s):					

DESCRIPTION OF OTHER APPARATUS FORMING PART OF PRESSURE SYSTEM

Injector 1:	
Injector 1 - Steam Valve:	
Injector 1 - Blr Inlet Check v/v:	
Injector 2:	
Injector 2 - Steam Valve:	
Injector 2 - Blr Inlet Check v/v:	
Water Lifter:	
Water Lifter Steam Valve:	
Boiler Feed Pump:	
Boiler Feed Pump Check v/v:	
Blow Down v/v:	
Blower control v/v:	
Whistle Isolator v/v:	
Ancillary Valves and Pipework:	

SPECIAL REQUIREMENTS - The following 'Special Requirements' are noted:

CONCLUSION	**SCHEME REF:**	
The Maximum Safe Working Pressure of this System is:		PSI
Inspection Schedule Ref:		
Thorough Examination period:		Months
Hydraulic Examination period:		yrs
Scheme Issue Date:		Scheme Approved by: NTET
Scheme Author		Qualifications
Company Name		

Basis of Written Scheme

We, the undersigned, declare that the information provided above forms the true basis of this Written Scheme of Examination prepared in accordance with the PSSR 2000.

Basis of Examination Schedule

We, the undersigned, further agree that the examination schedule and examination period assigned to the items included in this scheme accurately reflect the mechanical condition and proposed operating regime of the system, as at the date of this scheme, and that the arrangements described will be subject to review and modification as determined by conditions arising out of the operation and future examinations of the system, whether or not the system is at work.

Owners signature:		Competent Person's Signature:	

Notes

This Written Scheme of Examination (WSE), comprising the system description datasheets, examination schedules and these notes, and the associated Report Forms are all compliant with the requirements of PSSR 2000.

PSSR 2000 asserts that it is the owner's responsibility to appoint a competent person for the purpose of drawing up a Written Scheme of Examination and also for the purpose of examining the System according to that scheme. For the type of System to which this WSE relates the same competent person may undertake both roles.

The examination schedules (relating to the Periodic Examination and the Detailed Examination and Hydraulic Test) as applied to this system are cross-referenced to the detailed notes in Part 4 of the NTET's Engine Owners Code of Practice relating to Type A1 (Locomotive) examinations;

The Datasheets and any completed report forms relating to this system should be kept with this WSE.

The NTET's Engine Owners Code of Practice deals with the safe handling of waste materials

EXAMINATION SCHEDULE 1 - PERIODIC EXAMINATION (A1)

Preparation

Item	Description	NTET A1
1.	Drain boiler	P1
2.	Remove doors	P2
3.	Remove washout plugs	P3
4.	Washout water space	P4
5.	Remove ash pan and firebars	P5
6.	Clean firebox	P6
7.	Clean tubes	P7
8.	Clean smoke box	P8
9.	Remove fusible plug	P9
10.	Clean external fittings	P10
11.	Remove pressure gauge	P11
12.	Clean external surfaces and de-scale where necessary	P12
13.	Clean and de-scale water spaces	P15
14.	Remove sample tube (if requested by inspector)	P16
15.	Other requirements	

Cold Examination

Note: Prior to the inspector's arrival the engine should be safely parked in a dry area, where possible under cover, and access to all components should be free and unencumbered

Item	Description	NTET A1
1.	Visually examine boiler, internally and externally where accessible	C1, C25
2.	Examine fusible plugs	C2
3.	Hammer test stays and all accessible parts of the boiler	C3
4.	Examine for signs of steam and water leaks	C4
5.	Check water gauge test cock passages, Examine water gauge cocks, test cocks and blowdown valves	C5, C6
6.	Check gauge glasses and gauge glass protectors	C7, C8
7.	Examine manhole, mudhole doors and bridges and washout plugs and holes	C9, C10
8.	Check pressure gauge	C11
9.	Examine safety valves and springs	C12
10.	Examine feed check valves	C13
11.	Check all fittings directly attached to the boiler	C14
12.	Check and examine as necessary all pipe work carrying steam or hot water under pressure	C15
13.	Examine blastpipe	C16
14.	Examine piston and valve rod glands	C17
15.	Hammer test parts made accessible by removal of fittings	C18
16.	Visually examine all other parts of the pressure system	C19
17.	Further examination, by other means any part of the pressure system as required by the Boiler Inspector	C20
18.	Check non-ferrous fittings for signs of deterioration	C21
19.	Examine by other means all parts of the pressure system known to be subject to cracking or other non-visible defects	C22
20.	Examine Smokebox	C23
21.	Examine areas revealed by removal of sample tube and follow up	C24

The results and conclusions of this examination will be recorded in Part 2 of the examination report form

Examination in Steam

Notes:
1. The engine should be presented to the inspector having been completely reassembled to the highest practical standards and using only appropriate and approved materials
2. The number of persons in attendance at the Examination in Steam should be minimal and should not cause distraction to the examination process.

Task	Description	NTET A1
1.	Check for steam or water leaks	S1
2.	Check all steam and water valves	S2
3.	Check water gauge(s) and gauge glass protectors	S3, S4
4.	Check test cocks (if fitted)	S5
5.	Check blowdown valve(s)	S6
6.	Check pressure gauge and SWP markings	S7, S8
7.	Check safety valves	S9
8.	Check injector(s) and/or water feed pump	S10
9.	Check regulator	S11
10.	Check cylinder drain cocks	S12
11.	Check piston and valve rod glands	S13
12.	Check damper	S14
13.	Examine tube ends, as far as is practicable, Visually examine tube plate for leaks	S15, S16
14.	Check wash out plugs and fusible plugs (where practicable)	S17
15.	In Steam test to be carried out before the boiler lagging is replaced	S18

The results and conclusions of this examination will be recorded in Part 5 of the examination report form

EXAMINATION SCHEDULE 2 - DETAILED EXAMINATION (INCLUDING HYDRAULIC TEST)

Note: A detailed examination will normally be carried out at an interval not exceeding that prescribed in the Conclusion to this Written Scheme of Examination. A detailed examination may also be carried out subsequent to major works having been undertaken

Preparation

As per the Preparation for the Periodic Examination plus the following items

Item	Description	NTET A2
1.	Remove tubes*	P17
2.	Remove all fittings attached to boiler and dismantle as required *	P18
3.	Open up safety valves, feed check valves and water gauge fittings *	P19
4.	Remove safety valves *	P20
5.	Dismantle safety valves *	P21
6.	Anneal copper pipes	P22
7.	Remove lagging	P23

* At the Inspectors discretion

Cold Examination

As per the Cold Examination for the Periodic Examination plus the following

Item	Description	NTET A2
1.	All fittings, fasteners and attachments removed from the boiler and dismantled	C14
2.	Safety valves, feed check valves and water gauge fittings	C12
3.	Check non-ferrous fittings for signs of deterioration	C21

The conclusions and results of this examination will be recorded in Part 2 of the examination report form

Hydraulic Test

Preparation: The system should be presented for test with the safety valves removed and the aperture securely covered by a suitable plate of appropriate thickness complete with a water inlet connection. In every other respect the water/steam side should be completely reassembled to the highest practical standards and using only appropriate and approved materials.

The lagging, firebars and ashpan ***should not be replaced***

An ample water supply should be available

Test: A Test Pressure, not exceeding 1.5 times the Maximum Safe Working Pressure of this system will be applied for a period of 30 minutes

During the test period checks will be made throughout the system in order to determine the extent of any plate distortion, bulging and excessive loss of pressure through leakages. Any minor loss of pressure may be regained by operation of the test pump

The results and conclusion of this test will be recorded on Form 1A of the Inspection Report Forms

Examination In-Steam

Preparation: The system should be presented to the inspector with the safety valves replaced.

The firebars and ashpan should be replaced

The lagging should not be replaced until after the examination has been concluded

In every other respect the water/steam side should be completely reassembled to the highest practical standards and using only appropriate and approved materials.

The number of persons in attendance at the In-Steam Examination should be minimal and should not cause distraction to the examination process

Examination: The Examination In-Steam is as per the Periodic Examination plus further observations in respect of leakage in and around the areas exposed by removal of the lagging

The results and conclusions of this examination will be recorded in Part 5 of the examination report form.

REVISIONS HISTORY

Date	Details of Revision	Signatories

National Traction Engine Trust

PRESSURE SYSTEMS SAFETY REGULATIONS 2000

WRITTEN SCHEME OF EXAMINATION

FOR APPLICATION TO A

VERTICAL WATER/FIRE TUBE BOILER

SCHEME REF: | Prepared by:

Make and Type of Engine

Maker's Number & I.D. Marks:

Description of System: ***Vertical Water/Fire Tube boiler with protective devices***

Year of Manufacture

Owner:		User	
Owners Address		Address at which the System is normally located	

PRESSURE VESSEL & ASSOCIATED DEVICES – MANUFACTURERS DETAILS AND SERIAL NUMBERS

Boiler:					
Safety Valve(s):					
Pressure Gauge:		*0 -*	PSI	*0 -*	Bar
Water Gauge 1:					
Water Gauge 2;					
Fusible Plug(s):					

DESCRIPTION OF OTHER APPARATUS FORMING PART OF PRESSURE SYSTEM

Injector 1:	
Injector 1 - Steam Valve:	
Injector 1 - Blr Inlet Check v/v:	
Injector 2:	
Injector 2 - Steam Valve:	
Injector 2 - Blr Inlet Check v/v:	
Water Lifter:	
Water Lifter Steam Valve:	
Boiler Feed Pump:	
Boiler Feed Pump Check v/v:	
Blow Down v/v:	
Blower control v/v:	
Whistle Isolator v/v:	
Ancillary Valves and Pipework:	

SPECIAL REQUIREMENTS - The following 'Special Requirements' are noted:

CONCLUSION		**SCHEME REF:**	
The Maximum Safe Working Pressure of this System is:		PSI	
Inspection Schedule Ref:			
Thorough Examination period:		Months	
Hydraulic Examination period:		yrs	
Scheme Issue Date:		Scheme Approved by:	*NTET*
Scheme Author		Qualifications	
Company Name			

Basis of Written Scheme

We, the undersigned, declare that the information provided above forms the true basis of this Written Scheme of Examination prepared in accordance with the PSSR 2000.

Basis of Examination Schedule

We, the undersigned, further agree that the examination schedule and examination period assigned to the items included in this scheme accurately reflect the mechanical condition and proposed operating regime of the system, as at the date of this scheme, and that the arrangements described will be subject to review and modification as determined by conditions arising out of the operation and future examinations of the system, whether or not the system is at work.

Owners signature:		Competent Person's Signature:	

Notes

This Written Scheme of Examination (WSE), comprising the system description datasheets, examination schedules and these notes, and the associated Report Forms are all compliant with the requirements of PSSR 2000.

PSSR 2000 asserts that it is the owner's responsibility to appoint a competent person for the purpose of drawing up a Written Scheme of Examination and also for the purpose of examining the System according to that scheme. For the type of System to which this WSE relates the same competent person may undertake both roles.

The examination schedules (relating to the Periodic Examination and the Detailed Examination and Hydraulic Test) as applied to this system are cross-referenced to the detailed notes in Part 4 of the NTET's Engine Owners Code of Practice relating to Type B (Vertical Water/Fire Tube) examinations;

The Datasheets and any completed report forms relating to this system should be kept with this WSE.

The NTET's Engine Owners Code of Practice deals with the safe handling of waste materials

EXAMINATION SCHEDULE 1 - PERIODIC EXAMINATION

Preparation

Item	Description	NTET B1
1.	Drain boiler	P1
2.	Remove doors	P2
3.	Remove washout plugs	P3
4.	Washout water space	P4
5.	Remove ash pan and fire-grates	P5
6.	Clean fire side	P7
7.	Remove fusible plug	P8
8.	Clean external surfaces	P9
9.	Remove pressure gauge	P10
10.	Dismantle Safety Valves (At Inspectors request)	P11

Cold Examination

Note: Prior to the inspector's arrival the engine should be safely parked in a dry area, where possible under cover, and access to all components should be free and unencumbered

Item	Description	NTET B1
1.	Visually examine boiler, internally and externally where accessible	C1, C25
2.	Examine fusible plugs	C2
3.	Visually examine and hammer all parts of the boiler	C3
4.	Examine for signs of steam and water leaks	C4
5.	Check water gauge test cock passages, Examine water gauge cocks, test cocks and blowdown valves	C5, C6
6.	Check gauge glasses and gauge glass protectors	C7, C8
7.	Examine manhole, mudhole doors and bridges and washout plugs and holes	C9, C10
8.	Check pressure gauge	C11
9.	Examine safety valves and springs	C12
10.	Examine feed check valves	C13
11.	Check all fittings directly attached to the boiler	C14
12.	Check and examine as necessary all pipe work carrying steam or hot water under pressure	C15
13.	Examine regulator block	C16
14.	Hammer test parts made accessible by removal of fittings	C17
15.	Visually examine all other parts of the pressure system	C18
16.	Further examination, by other means any part of the pressure system as required by the Boiler Inspector	C19
17.	Examine Firebox securing bolts	C20

The results and conclusions of this examination will be recorded in Part 2 of the examination report form

Examination in Steam

Notes:
1. The engine should be presented to the inspector having been completely reassembled to the highest practical standards and using only appropriate and approved materials
2. The number of persons in attendance at the Examination in Steam should be minimal and should not cause distraction to the examination process.

Task	Description	NTET B1
1.	Check for steam or water leaks	S1
2.	Check all steam and water valves	S2
3.	Check water gauge(s) and gauge glass protectors	S3, S4
4.	Check test cocks (if fitted)	S5
5.	Check blowdown valve(s)	S6
6.	Check pressure gauge and SWP markings	S7, S8
7.	Check safety valves	S9
8.	Check injector(s) and/or water feed pump	S10
9.	Check regulator	S11
10.	Check Ash Pan controls	S12
11.	Check wash out plugs and fusible plugs (where practicable)	S13

The results and conclusions of this examination will be recorded in Part 5 of the examination report form

EXAMINATION SCHEDULE 2 - DETAILED EXAMINATION (INCLUDING HYDRAULIC TEST)

Note: A detailed examination will normally be carried out at an interval not exceeding that prescribed in the Conclusion to this Written Scheme of Examination. A detailed examination may also be carried out subsequent to major works having been undertaken

Preparation

As per the Preparation for the Periodic Examination plus the following items

Item	Description	NTET B2
1.	Dismantle Pipework	P12
2.	Remove firebox	P13
3.	Expose water surfaces	P14
4.	Descale water side	P15
5.	Remove boiler fittings	P16
6.	Remove lagging	P17
7.	Remove Boiler	P18
8.	Descale External Surfaces	P19
9.	Anneal copper pipework	P20
10.	Remove all pressure pipework	P21
11.	Remove all tubes	P22

Cold Examination

As per the Cold Examination for the Periodic Examination plus the following

Item	Description	NTET B2
1.	Check for signs of deterioration in non-ferrous fittings	C21
2.	Examine by other means all parts of the pressure system known to be subject to cracking or other non-visible defects	C22
3.	Hydraulic Test	C23

The conclusions and results of this examination will be recorded in Part 2 of the examination report form

Hydraulic Test

Preparation: The system should be presented for test with the safety valves removed and the aperture securely covered by a suitable plate of appropriate thickness complete with a water inlet connection. In every other respect the water/steam side should be completely reassembled to the highest practical standards and using only appropriate and approved materials.

The lagging, firebars and ashpan ***should not be replaced***

An ample water supply should be available

Test: A Test Pressure, not exceeding 1.5 times the Maximum Safe Working Pressure of this system will be applied for a period of 30 minutes

During the test period checks will be made throughout the system in order to determine the extent of any plate distortion, bulging and excessive loss of pressure through leakages. Any minor loss of pressure may be regained by operation of the test pump

The results and conclusion of this test will be recorded on Form 1A of the Inspection Report Forms

Examination in Steam – see following page

Examination In-Steam

Preparation: The system should be presented to the inspector with the safety valves replaced.

The firegrates and ashpan should be replaced

The lagging should not be replaced until after the examination has been concluded

In every other respect the water/steam side should be completely reassembled to the highest practical standards and using only appropriate and approved materials.

The number of persons in attendance at the In-Steam Examination should be minimal and should not cause distraction to the examination process

Examination: The Examination In-Steam is as per the Periodic Examination plus further observations in respect of leakage in and around the areas exposed by removal of the lagging

The results and conclusions of this examination will be recorded in Part 5 of the examination report form.

REVISIONS HISTORY

Date	Details of Revision	Signatories

PART 4

WRITTEN SCHEME OF EXAMINATION

APPENDIX B

BOILER EXAMINATION REPORT TEMPLATES

B1 – Examination Certificate
B2 – Thorough Examination Report Part 1 - Cold
B3 – Thorough Examination Report Part 2 – In Steam
B4 – Supplementary Cold Examination Hydraulic Test

National Traction Engine Trust

PRESSURE SYSTEMS SAFETY REGULATIONS 2000

LOCOMOTIVE TYPE OR VERTICAL WATER/FIRE TUBE BOILER EXAMINATION CERTIFICATE

Certificate/Report Number:

1. System Details

a) Makers Details

Make: Boiler Serial No:

Works Serial No: Reg No: Year:

b) Owner:

c) Address:

2. Declaration

I have concluded my examination of the System detailed above in the manner and to the extent described in the Written Scheme of Examination and in the related report(s), and this is a true statement of the result of the examination(s).

A* It is my considered opinion that the System may be returned to service and operated at the Safe Working Pressure of PSI Bar

Date of next Thorough Examination:

Inspectors Signature:

Inspector:

Company:

Qualifications:

Address:

Date:

NB: This Certificate is valid only in support of an application for an NTET Insurance Disc.

The comprehensive record of the Thorough Examination consists of this Certificate and all of the related documentation.

National Traction Engine Trust

PRESSURE SYSTEMS SAFETY REGULATIONS 2000

REPORT OF A COLD EXAMINATION OF A LOCOMOTIVE TYPE OR VERTICAL WATER/FIRE TUBE BOILER

1. PREAMBLE

1.1 Report Number: | **WSE Ref**:

1.2 System Details

Makers Details

Make: | Boiler Serial No:

Works Serial No: | Reg No: | Year:

Boiler Type:

WSE Ref: | Review Date:

Name and Address of Owner:

Name and Address of User

1.3 Previous Examination Summary

Previous Report Ref:

Inspection Company:

Date of Cold Examination:

Maximum Safe Working Pressure Specified: PSI Bar

Date of last hydraulic test: | Report Ref:

2. COLD EXAMINATION DETAILS

2.1 Preamble

Date: | Location:

Inaccessible areas/items:

Date of Last known examination of inaccessible areas/items:

2.2 External Condition

		Thicknesses
a) Barrel/Shell:		
b) Firebox outer wrapper:		
c) Horn-plates:		
d) Throat-plates:		
e) Backhead:		
f) Smokebox tube plate:		

2.3 Internal Surfaces

a) Smokebox tube-plate:	
b) Barrel/Shell:	
c) Throat-plate:	
d) Backhead:	
e) Firebox outer wrapper:	
f) Horn Plates	

2.4 Doors, Bridges & Washout Plugs

a) Spigot Clearances:
b) Sealing Surfaces:
c) Bridges and Threads:
d) Washout Plugs

2.5 Firebox (Fire-Side) **Thicknesses**

a) Crownplate:
b) Side-plates :
c) Tube-plate:
d) Door-plate:

2.6 Firebox (Water-side)

a) Crown-plate:
b) Side-plates:
c) Tube-plate:
d) Door-plate:
e) Foundation 'Z' Ring:

2.7 Fusible Plugs

a) Condition of filling:
b) Condition of threads:

2.8 Stays **Wastage**

a) Longitudinal/Cross Stays (if fitted)
b) Firebox crown stays condition
c) Side Stays:
d) Palm Stays:

2.9 Tubes

a) Date Fitted:
b) Waterside Condition:
c) Smokebox ends:
d) Firebox ends:

2.10 Superheater Element (Where fitted)

a) Elements:
b) Headers:

2.11 Feedwater Heater (Where fitted)

2.12 Pressure Fittings

a) Safety valves
b) Pressure Gauge
Dial Range *0 -* PSI: Red Line PSI
Calibration Date: Method:
c) Water gauges and 'try' cocks
d) Feedwater check valves
e) Blowdown Cocks
f) Steam Turret
g) Studs and other securing devices:

2.13 External Pipework subject to steam or hot water under pressure

a) Steam to injector(s):	
b) Water from Injector(s) to boiler:	
c) Steam to water lifter:	
d) Steam to pressure gauge:	
e) Steam to Blower:	
f) Others, specify:	

2.14 Any other components forming part of pressure system not specified above

a) Observations:

3. GENERAL OBSERVATIONS

3.1 Other Pertinent Observations

a) Observations:

4. OUTCOME OF COLD EXAMINATION

4.1 Defects Observed

a) The Defects listed below here do not prevent the system from being examined 'In-Steam' but must be rectified before the System is returned to service:

b) The Defects listed below here are required to be rectified before the system is examined 'In-Steam':

i) Is a cold re-examination required before the 'in-steam' examination?	*Yes/No*	*If Yes see 4.3 for Release Statement*
ii) Is a hydraulic test required before the 'in-steam' examination?		

4.2 Declaration

a) As a result of my examination detailed above I consider that the safe working pressure for the System is: PSI Bar

i) State the reason(s) for any changes since last report:

ii) State the reason(s) for any changes required to Written Scheme of Examination:

b) I have concluded my 'Cold' examination of the System detailed above in the manner and to the extent described in the Written Scheme of Examination and I consider that the System ***may/may not*** ** be prepared for an 'in-steam' examination.

** strike out that which does not apply

Inspectors Signature: Date:

Inspectors Name:

4.3 Release Statement – Cold Examination

I declare that the defects described in Section 4.1.(b) above have been rectified to my satisfaction and that the system may now be prepared for the 'in-steam' examination.

Inspectors Signature: Date:

Inspectors Name:

National Traction Engine Trust

PRESSURE SYSTEMS SAFETY REGULATIONS 2000

REPORT OF AN IN-STEAM EXAMINATION OF A LOCOMOTIVE TYPE OR VERTICAL WATER/FIRE TUBE BOILER

'IN STEAM' EXAMINATION

1 Preamble

a) Report Ref: | WSE Ref:

b) 'In-Steam' Examination Location:

c) 'In-Steam' Examination Date:

2 Examination Results

a) Safety Valve Operation

Opened: PSI | Accumulation PSI | Closed PSI

b) Pressure Gauge:

c) Water Gauge(s):

d) Feed Check Valve(s):

e) Blow-down Cocks:

f) Injector(s):

g) Feed Pump:

h) Other Items:

3 Defects Observed

a) The Defects listed below do not prevent the System from being returned to service but should be rectified no later than this date:

List of Defects

b) The Defects listed below are required to be rectified before the System is returned to service:

List of Defects

(i) Is a 'cold' re-examination required prior to a further In-Steam re-examination? Yes/No

4 Declaration

a) I have concluded my 'In-Steam' examination of the System detailed above in the manner and to the extent described in the Written Scheme of Examination and this is a true statement of the results.

b) I consider that the safe working pressure for the System is: PSI

State the reason for any change(s) since last report:

Recommended modification(s) to the Written Scheme of Examination:

c) I therefore declare that the System ***may/may not*** be returned to service

Inspectors Signature: Date:

Inspectors Name

NB: Applications for an NTET Disc should be made using the Examination Certificate

Copy this symbol into check box areas as required √

National Traction Engine Trust

PRESSURE SYSTEMS SAFETY REGULATIONS 2000

SUPPLEMENTARY COLD EXAMINATION REPORT RELATING TO A LOCOMOTIVE TYPE OR VERTICAL WATER/FIRE TUBE BOILER

PART 1A – SUPPLEMENTARY COLD EXAMINATION – HYDRAULIC TEST

Report Number: **WSE Ref:**

1. ADMINISTRATIVE DETAILS

1.1 Inspector: **Company:**

1.2 System Details

a) Makers Details

Maker: Boiler Serial No:

Works Serial No: Year:

Boiler Type

b) Written Scheme of Examination Ref: Review Date:

c) Name and Address of Owner:

1.3 Previous Hydraulic Test Summary (Where Applicable)

a) Date of previous hydraulic test: Report Ref/ID:

b) Test Pressure Applied: PSI Max Safe Working Pressure Specified: PSI

2. HYDRAULIC TEST DETAILS AND RESULTS

2.1 Test Details

a) Address at which test was undertaken: Date:

b) Test Pressure: PSI Period Applied: Minutes

c) Lagging removed?: ***Yes/No*** If 'No' State reason:

2.2 Defects Observed

a) The Defects listed below do not prevent the system from being examined 'In-Steam' but must be rectified before the System is returned to service.

List of Defects

b) The Defects listed below are required to be rectified before the system is examined 'In-Steam':

List of Defects

Is a cold re-examination required before the 'in-steam' examination? *Yes/No*

Is a further hydraulic test required before the 'in-steam' examination? *Yes/No*

2.3 Declaration

a) As a result of the hydraulic test detailed above I consider that the safe working pressure for the System to be: PSI

State the reason(s) for any change since last report:

State the reason(s) for any changes required to Written Scheme of Examination:

b) I have concluded a hydraulic test of the System as described in this report and I consider that the System ***may/may not**** be prepare for an 'in-steam' examination. ** strike out that which does not apply*

Inspectors Signature: Date:

Inspectors Name: