

MINIATURE LIVE STEAM LOCOMOTIVE RUNNING AT G SOCIETY MEETINGS OR EVENTS

RULES AND BEST PRACTICE

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Preamble

Though the locomotive power in the G Society is mainly electric by track supply or batteries, there's an active interest in running live steam – the collections of many in the Society run across such boundaries. If improperly or carelessly handled there is more risk of an unsafe incident with steam than electric power. To guard against this it is important that safety rules and recommended best practice are known and followed.

This document sets out the basic rules for operating miniature steam locos regarding certification and good practice for both locomotives and the running environment.

Minimal details of boiler and gas tank testing requirements and procedures are included in this text. If more depth is desired please refer to The Boiler Test Code 2018 Volumes 2 and 3, Ref 1 and Ref 2 in Appendix 2, for miniature boilers and gas tanks respectively.

A: Definitions

1. **A G-Society meeting** is a meeting organised by the G Society or one of its Member Groups, or a running session (such as an Open Day) organised as a G Society event by a Member.
2. **Small Boiler (high pressure).** Defined as having a Working Pressure over 2 bar (Pw) and sized such that $P_w \text{ (in bar)} \times \text{Boiler Volume (in litres)}$ of less than **3 barlitres**. The boiler may be made of copper or brass but there are different testing and certification requirements for these two materials as summarised in Appendix 3. The boiler is fitted with a Pressure Relief Valve (PRV) set to open at the Pw or less. Certified Hydraulic and steam tests are required by The Boiler Test Code 2018 Vol 2.
3. **Small Boiler (Low Pressure) – Class LO.** Pressure less than 2 bar and with an 'open' boiler output, that is a spring loaded reverser or oscillating cylinders held to the team ports by spring pressure. This arrangement is typically found in Mamod/MSS and some Bassett-Lowke locomotives. The boiler is fitted with a PRV set to open at 2 bar or less. No hydraulic test is required.

4. **Small Boiler (Low Pressure – Class LS).** Pressure less than 2 bar but with the boiler output through a fixed valve that can be fully closed. The boiler is fitted with a PRV set to open at 2 bar or less. In this case Hydraulic Test and certification is required, as in 2. above.
5. **Gas Tank.** Where fitted the gas fuel tank must have a volume of **less than 250 ml, and be made of copper.** Hydraulic Test certification is required per The Boiler Test Code 2018, Vol 3.

B: Requirements : Miniature Steam Locomotives

6. **The Owner or Operator of a locomotive must be a Member of the G Scale Society**
 - i. **Or a Visitor to an organised G Scale event as defined in A.1.**
7. **Valid boiler hydraulic and steam test certificates, and gas tank certificates (where appropriate) **MUST** be presented before steaming a loco.**

Locomotives in the Class LO are excepted.

No certificates – no running

8. **Gas Fuel.** For indoor running at ambient temperatures (say 15 deg C or over) butane gas should be used. For outdoor running butane or a butane/propane mix can be used. See Appendix 4 for guidance.
9. **Solid fuel.** Mamod/MSS solid tablets are still legal to use but must be purchased through a license.. Alternatively **Mamod Gel fuel** may be used.
10. **Spirit liquid fuel.** Meths or alcohol is not permitted because of high fire risk, invisible flames (esp in strong light).
11. **Coal & Charcoal.** Not permitted indoors because exhaust fumes can contain carbon monoxide.
12. Locomotives may be radio control or manual control.
13. Members are responsible for providing their own supplies of steam oil, water and fuel unless alternative arrangements are made with another Member, attendee, or the organising Group..

C: Requirements : Environment

14. Ventilation of the operating space is essential. All fuel burning steam locomotives emit exhaust fumes and these should be vented. This obviously applies primarily to indoor running. Outdoor running is ideal from the ventilation perspective but be aware that miniature steam locomotives can be challenging to run in breezy conditions, which tend to interfere with steady combustion.

15. Running locomotives are hot. Signs should be posted at the track warning spectators not to touch the locomotives. This is especially important when children are present.
16. In this context it the operator's running kit should include a pair of insulating grip gloves. Even in well controlled circumstances manual intervention is sometimes necessary. Also for removing a loco from the track to the prep area should the loco still be warm.
17. Though fires are rare it is a wise precaution to have a fire extinguisher and/or a fire blanket within reach. Powder or CO2 extinguishers are recommended.
18. Locomotives should be fuelled and prepared away from the running lines, especially gas fuelled. Once ready locos should be carefully carried to the running tracks and lit, and steam raised there. This is best done in a siding as condensate discharges onto the track while the steam pipes are being cleared. Under-track pans are a good idea, and a good supply of kitchen towels.
19. At the end of a run should some fuel may still be left in the locomotive. This should be vented or removed in the prep area away from the running track(s) before the locomotive is packed away for transport.
20. Locomotives should be left to cool before packing away in their box or container.

Appendix 1: G Society Live Steam Contact

The G Scale Society Live Steam Contact: Mike Gray, grayjohnmichael@aol.com or 07751 978563 (preferably email or text).

This write-up is intended to cover most circumstances within a relatively compact document, but such is the world of miniature steam that occasional eccentricities happen. In such cases please contact me as above for advice or follow up.

Appendix 2 : Boiler and Gas Tank Test Codes

1. The Boiler Test Code 2018 Volume 2 - Boilers under 3 bar litres. Effective from 1st May 2018.
2. The Boiler Test Code 2018, Volume 3 – LPG tanks under 250 ml. Effective from 1st May 2018

These may be downloaded from the Northern Association of Model Engineers (NAME) website.

Appendix 3 : Locomotive Certification.

- i. If the locomotive in the High Pressure or LS Classes is **less than one year old** (from date of the maker's original certification) the maker's certificate(s) are valid.
- ii. If the locomotive is more than one year old then a ***Record of Inspection and Safety Checks*** is required. These should be signed by an approved boiler tester from a recognised Society or Club (for example the 16mm NGM, G1MRA, Model Power Boat Association, or a Model Engineering Society affiliated to one of a Model Engineering

Association). They are usually witnessed (signed) by the locomotive owner or operator. A copy of this form may be downloaded from XXXXXXXX (TBD).

- iii. Some Societies use a **full form** made out annually. This is also acceptable.
- iv. It is recommended that the boiler is steam tested annually (or thereabouts) and the Pressure Relief Valve (PRV) lift pressure checked and recorded, as in the forms indicated in ii and iii above.
- v. The initial Pw x 2 Hydraulic Certificate for a **copper** miniature boiler is valid for life unless the boiler has been modified or repaired after damage, in which case a Pw x 2 retest Hydraulic Certificate is required.
- vi. The initial (Pw x 2) Hydraulic Certificate for a **brass** miniature boiler is valid for life unless the boiler has been modified or repaired after damage, in which case a retest Hydraulic Certificate is required. But a **brass** boiler must have a repeat Hydraulic Test at 3 year intervals at Pw x 1.5 pressure (ie the pressure used with boiler fittings in position, except the PRV).

Appendix 4 : Vapour (Gas) Pressures : Butane vs Mix

In the case of gas fired locomotives the recommended fuel is butane, especially for indoor use. However a butane rich mix with propane may be appropriate under some conditions. A 70% butane and 30% propane mix is common though the Roundhouse user instruction manual permits up to 40% propane.

But under what circumstances should a mix be used?

The temperature-vapour pressure (VP) curves for butane and a 70/30 mix are shown below. At a typical room ambient temperature of about 15-20 deg C butane has a VP of around 10 to 15 psi gauge (ie pressure above atmospheric). This is sufficient for the transfer of liquid from a fuel canister to the gas tank, and to light up and drive the burner in the boiler.

If running in winter at temperatures below about 10 deg C the butane VP drops away (to zero at 0 deg C). There is little or no pressure to drive transfer from canister to the gas tank or the GT to the burner. At temperatures below about 10 deg C it is better, indeed necessary, to use a 70/30 mix, or thereabouts.

Operational Tip: As the gas tank picks up heat from the boiler (in most designs) the pressure in the tank rises and the burner output increases. Excessive steam blow off from the PRV results. This wastes gas and water, but can be avoided by gradually closing the gas control valve during the run. The run duration may thus be extended.

On no account should pure propane be used.

