The Boiler Test Code 2018

VOLUME 3 - LPG tanks under 250ml

Effective from 1st May 2018

Prepared by:

10¼" Gauge Railway Society, 7¼" Gauge Society,
Association of 16mm Narrow Gauge Modellers,
Gauge 1 Model Railway Association, Midland Federation of Model Engineers,
Model Power Boat Association, Northern Association of Model Engineers,
Southern Federation of Model Engineering Societies

CONTENTS

1 Introduction

1.1. This Test Code has been prepared by:

- 10¼" Gauge Railway Society
- 7¼" Gauge Society
- Association of 16mm Narrow Gauge Modellers
- Gauge 1 Model Railway Association
- Midland Federation of Model Engineers
- Model Power Boat Association
- Northern Association of Model Engineers
- Southern Federation of Model Engineering Societies
- Walker Midgley Insurance Brokers

1.1 Guidance produced by the Health and Safety Executive and the model engineering federations and associations recommend that any gas tank must be constructed to sound engineering practice.

1.2 The Health and Safety Executive considers it good practice for persons using pressure equipment to provide the same level of health and safety protection as they would if they were duty holders under the Pressure Systems Safety Regulations 2000 (PSSR). To aid this process, this Code has therefore been prepared using the principles of the PSSR. Where applicable this Code complies with PSSR 2000.

1.3 It is considered that the procedures in this document represent good practice for model engineering applications.

1.4 This document shall be considered as the Written Scheme of Examination as described in the PSSR, when used in conjunction with the test certificate associated with an individual pressure vessel.

1.5 When operating models where the Health and Safety at Work etc. Act 1974 applies, compliance with the requirements of PSSR shall be necessary. The PSSR require that this test Code is used in conjunction with the applicable Written Scheme of Examination certificate.

1.6 Individuals or organisations seeking insurance need to check that the requirements herein are acceptable to their insurer.

1.7 The provisions of this Test Code shall come into effect on 1st May 2018 and shall not be retrospective.

2 Purpose

2.1 The provisions of this Code apply only to tanks made of brass or copper.

2.2 The Code applies to models where heating of a steam boiler is by LPG contained in a Small Gas Tank.

2.3 The testing and certification of a refillable tank made to contain LPG are important safeguards. An agreed test procedure, common across the hobby, is desirable to achieve consistency and to demonstrate that reasonable precautions have been taken in the event of any mishap.

2.4 The Code applies to any tank constructed by the Maker or subsequently acquired from the Maker by an owner/user. Sections 5 through 8 of the Code do not apply to a tank constructed by a commercial builder but such a tank should be subject to a five-yearly safety check. The Code does not apply to nor does it prohibit the proper use of any commercial non-refillable canister of LPG used in place of a tank.

2.5 Following this code will enable the owner/user of a pressure system to fulfil duties and responsibilities that may be placed upon them by the requirements of the Pressure Systems Safety Regulations 2000 are satisfied (where applicable).

3 Definitions

3.1 'Shall' is mandatory, 'should' is advisory

3.2 Small Gas Tank: a gas tank with a volume of 250ml or less.

3.3 Code: the test code described in this document.

3.4 Member: a person who is a member of the one of the groups listed in 1.2, either directly or through one of their affiliated societies.

3.5 Maker: a Member who constructs a gas tank for personal use or for use by another Member, which will be subject to this Code.

3.6 Liquefied Petroleum Gas (LPG): in the context of this Code comprises commercial butane or a butane/propane mix with a maximum propane content of 40%.

3.7 Mixed gases: LPG commercially available in containers holding a mixture of two or more gases – commonly butane/propane.

3.8 Safety check: a check for leaks (sections 8 & 13), carried out at five year intervals.

3.9 Association(s): means one or more of the groups listed in 1.2 above, either directly or through one of their affiliated societies.

3.10 Competent Person: for the purposes of this Code, a Member of and appointed by the management committee of the club, society or Association under whose name the tank is examined and/or tested after such persons have satisfied that committee that they have the appropriate level of experience and/or qualifications.

3.11 Witness: for the purposes of this Code, a person who observes the examination and test of a tank and signs the certificate in such capacity. The witness shall be a Member of the Association and, at the Inspector's discretion, may be the owner/user of the tank.

3.12 Inspector: for the purposes of this Code, either a Member of one of the Associations and a Competent Person (as defined in para.3.11 above) who is neither the builder nor the owner/user, or a similar officer appointed by another society or association that is recognised by the Associations, or a commercial organisation appointed by the Associations that can offer facilities for testing per this Code.

3.13 Hydraulic test: test carried out to verify the integrity of the tank shell at a pressure greater than that which it will be exposed to in use (section 7).

3.14 Safeguard test): test carried out prior to first installation to verify that there are no leaks at normal working pressure (section 8).

3.15 All pressures quoted are gauge pressures. No absolute pressures are used. All uses of "psi" mean gauge pressure.

3.16 Commercially Built means a Small Gas Tank or model placed on the market for sale.

4 Role of Inspectors

4.1 Inspectors undertake their duties on a voluntary non-commercial basis and all examinations and tests are carried out entirely at the discretion of the Inspector. Inspectors are not under any obligation to test every tank presented for certification and they will only test and certify a tank that they feel competent to test based on their own experience.

4.2 A test shall be carried out and a test certificate issued only by an Inspector.

4.3 An Inspector appointed by the Associations may test a tank only if its Maker or current owner/user is a Member of the Associations. The Inspector is under no obligation to test a tank or to undertake the marking of any tank.

4.4 The decisions taken by boiler Inspectors shall be taken as final (see section 15).

4.5 An Inspector shall not inspect their own work, unless that work has already been tested and passed by another inspector.

5 Visual examination of a tank

5.1 A tank may be of any shape, with a maximum capacity of 250ml and designed to be refillable from a commercial canister of LPG. It shall be constructed of brass or copper to satisfy the requirements of the test procedures set out in this Code.

6 Test schedule

6.1 The testing shall comprise a hydraulic test (section 7) followed by a safeguard test (section 8). The object of the hydraulic test is to verify that the structure of the tank suffers no undue permanent distortion. The objective of the safeguard test is to verify that the tank is leak proof at the specified pressure and that there are no observable leaks from any fittings. Any observable leak or undue residual distortion of the tank shall be regarded as a failure.

6.2 Repeat tests shall take place following any repair to the tank, in which case the tank will be considered new and the full sequence of tests described in 6.1 should be carried out.

7 Hydraulic test

7.1 The tank should be without fittings and unmounted in order that it may be inspected all round. If this is impractical the agreement of the Inspector will be required before the test can proceed. This requirement applies to both initial and any subsequent hydraulic tests.

7.2 The specified initial test pressure for the hydraulic test of the tank, as described in this Code shall be 400 psi. This will apply for all tanks regardless of whether intended to be used for butane only or a butane/propane mix with a maximum propane content of 40%.

7.3 The procedure shall consist of raising the hydraulic pressure from zero to the test pressure, stopping at several intermediate pressures for careful visual examination until the full test pressure is attained. Each test pressure shall be held long enough to investigate any distortion of the vessel and to confirm that any fall in pressure is not caused by structural weakness and that there are no observable leaks.

8 Safeguard test

8.1 The tank should be unmounted but with the gas filler valve and gas control valve in place. The tank shall be filled with LPG of a type specified by the Maker or owner/user and the gas mixture should be at or raised to approximately 20ºC to test for leaks from the fittings. Any observable leak shall be regarded as a failure and the tank and fittings shall be repaired and then re-submitted for a further safeguard test.

8.2 After completion of hydraulic and safeguard test, safety checks shall be carried out on the gas tank at no longer than 5-year intervals (section 13), or when the model is next used if greater than that time interval since previous use.

9 Certificates

9.1 Certificates issued by a member of the one of the groups listed in 1.1, either directly or through one of their affiliated societies prior to the implementation of this Code will be considered valid whilst they remain in date.

9.2 Certificates issued by a commercial builder are acceptable.

9.3 The certificate used as part of this Code shall be common across and available from the Associations.

9.4 Each certificate shall bear the following information.

a. The name of the Club/Society and Organisation issuing the certificate
b. The name of the Owner/User
c. The location where the test was carried out
d. Identification of the system that the certificate relates to, e.g. boiler number
e. The Maker of the tank
f. The tank Identification markings (see section 12)
g. Material(s) used in construction
h. Date of construction, if known
i. Test pressure of the test just completed
j. Signature of the Inspector and the Witness
k. Notes and comments where applicable, including unusual construction and repaired damage

9.5 The completed certificate will be given to the owner/user of the tank for safekeeping – if the Ownership changes, the certificate should pass to the new owner/user.

9.6 The Maker's or owner/user's attention shall be drawn to their responsibility that the tank is only used with butane or a butane/propane mix below 40% propane and is not warmed or exposed to a temperature exceeding 60˚C.

9.7 If the original certificate is not available or the tank has received structural repair or alteration, the testing schedule described in section 6 shall be adopted.

10 Numbering of certificates

10.1 The relevant association will issue a personal identification code to each Inspector, or will issue Inspectors with pre-numbered certificates.

10.2 Inspectors shall number each certificate issued with their personal numbering system as assigned by the relevant association and record each certificate's date of issue, number and pertinent information in a record book.

11 Equipment for testing

11.1 Test Gauge: a test gauge which has, within the previous two years, been checked and calibrated to within ± 2% either against a currently validated dead weight test apparatus or against other traceable equipment. The test gauge may also be calibrated by a commercial test facility that shall provide a calibration test certificate. The calibration record shall be available for examination. Any errors identified on the calibration record shall be taken in to account when subsequently using the gauge for test or calibration purposes. The test gauges shall be checked at every use for sticking movement and correct zero indication.

11.2 The gauge range should be approximately 1.5 x the pressure of the test, (e.g. a range 0-600 psi will be satisfactory for test pressures up to 400 psi).

11.3 Each test gauge shall have a record in which gauge identification, details and calibration results are entered.

11.4 Certificates issued by a recognised gauge testing authority are an acceptable alternative to keeping a logbook and must be retained.

12 Marking of tanks

12.1 The tank shall be indelibly marked with a unique identification number. The form and position of the marking shall not damage or compromise the structure of the tank. The tank shall also carry a mark indicating the type of LPG for which it was constructed.

13 Safety Check

13.1 A safety check shall be conducted at five yearly intervals. It shall take the form of a leak test (see section 14).

13.2 Where reasonably practicable the whole of the tank shall be examined visually by removal of covering. Where not possible spraying or covering the accessible tank joints and unions with soap solution should be used to reveal any leakage.

13.3 Any leakage observed must be corrected before further use of the tank.

13.4 Results of the observations will be recorded on the safety check documentation.

14 Leak Testing

14.1 The most commonly used leak test methods are water-immersion bubble test (see 13.2) and soap bubble test (see 13.3). The leak test should encompass the entire gas system (as described in 8.1). The gas mixture should be at or raised to approximately 20ºC.

14.2 The water-immersion bubble test, also called "bubble testing" or "dunking", is a traditional and relatively primitive technique of leak detection. It is considered less sensitive than the soap bubble test and requires that the entire gas system be removed from the model for testing. It consists of charging the gas system, usually with high-pressure dry air or nitrogen, immersing it in a water tank and watching for escaping bubbles. The larger and more frequent the bubbles, the bigger the leakage. Relatively small leaks are possible, but can be very difficult to detect using this method.

14.3 The soap bubble test uses a solution comprising a mix of water, liquid soap and glycerine. Instead of submersing the part in water, the pressurized unit to be tested is sprayed or painted with a soap solution and the operator can see the bubbles formed by gas escaping from the leak. This method has a higher sensitivity than water immersion.

14.4 This soap bubble test is best used when the approximate area where a leak may exist is known. In this case, the soap solution is only used in that specific area to test for and pinpoint a leak. It is the simplest and least expensive method, material wise, known today.

14.5 A slow leakage from the gas valve, via the gas jet is not a reason for failure, but should be brought to the attention of the owner/user.

15 Disputes and clarification

15.1 If the Inspector is uncertain about any aspect of the tests in respect of this procedure, then they should decline to certify the tank and refer the owner/user for further tests by another Inspector or the relevant association.

15.2 Non-standard designs or alternative constructions outside the experience of the Inspector should be referred to another Inspector or the relevant association.

15.3 If the owner/user does not accept the decision of the Inspector, then the matter should be referred to another Inspector or the relevant association.

15.4 The Inspector may refuse to test tanks whose age and/or origin are unknown and the owner/user should be referred to the relevant association.

Appendix A: References

a. Pressure Equipment (Safety) Regulations 2016 No 1105
b. The Pressure Systems Safety Regulations 2000. SI 2000 No 128
c. Pressure Systems Safety Regulations 2000. Approved Code of Practice L122 (PSSR2000)

Further information can be obtained from the technical representatives of the clubs and societies listed in 1.1.

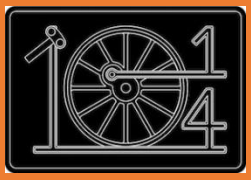
16 Index

Notes

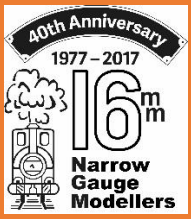
Notes

Notes

Notes

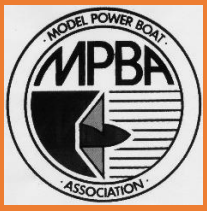

1
4

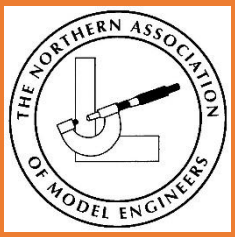

7½ INCH GAUGE
SOCIETY


40th Anniversary
1977 – 2017
16mm
Narrow
Gauge
Modellers


GAUGE '1' MODEL RAILWAY ASSOCIATION


MIDLAND FEDERATION OF MODEL ENGINEERS
M
F
M
E


MODEL POWER BOAT
MPBA
ASSOCIATION


THE NORTHERN ASSOCIATION OF MODEL ENGINEERS