An Update on Boiler Testing (March 2013)……..

By now, many of you will be aware that some changes have recently been made to the boiler testing procedures, and those with email and Internet access may well have also seen some of the detail of these changes. The purpose of this article is to ensure that all our members are aware that these changes have occurred and to outline how they affect us.

Before describing how these changes affect us, I think it would be useful to put into context why this latest revision has come about. Although many of us give a groan when the words “health and safety” and “best practice” are mentioned, it cannot be denied that we have progressed a long way forward in terms of materials technology, understanding of mechanical design and construction methods such that - in the steam world – catastrophic boiler failures are nowadays almost unheard of. That this situation has come about is in no small part due to improved standards being imposed on the boiler manufacturing industry by various legislative acts over the past 100 years or so. The latest incarnation of these being the PSSR (Pressure Systems Safety Regulations 2000) and the PER (Pressure Equipment Regulations). These sought to harmonize the slightly differing regulations adopted by the various countries making up the EEC with the intention of enforcing a common set of design, construction and testing requirements. Apart from ensuring that best engineering practice would be applied, this would also have the effect of ensuring that boilers not complying with these standards could not be sold within the EEC, thus ensuring a “level playing field” in commercial terms amongst the boiler manufacturers. This meant that our own industries should not be undermined by lower cost boilers manufactured to lower standards by “outside” manufacturers who did not adhere to the PSSR standards. However, the introduction of this regulation would adversely affect the ability to manufacture boilers for model engineering activities – both by commercial manufacturers and model engineers!

At this stage we have to appreciate that the scale and size of our models under the umbrella of “model engineering” has increased significantly over the years, and that they could be used in a commercial environment (eg, used to provide rides to the public on a model engineering society owned track in a public park). At various stages during early discussions about the proposed legislation with the HSE and other regulatory bodies we might easily have become banded into the same categories such as power-stations, full-size railways or fairground rides and have to comply with “their” rules. There was no provision for distinguishing between “full-size” activities and our small-scale, private model engineering activities.

Just prior to implementation of the PSSR 2000 Regulations, it was recognised that the imposition of the proposed legislation could have a catastrophic impact upon the activities of the model engineering fraternity. As a result, minds became focussed and the various model engineering federations and other representative bodies of the hobby got together and formed a single body to be called the Model Engineering Liaison Group (MELG) whose mandate was to engage with the various regulatory official bodies and look after the best interests of the model engineer. It has to be said that thanks to the work done in the past by many model engineering societies and the federations, effective regimes for boiler testing had evolved over the years and were remarkably consistent and fit-for-purpose. As a result of this satisfactory position of “self-regulation” within the hobby, it was successfully negotiated that boilers constructed by model engineers for their own use (ie, not constructed as a commercial proposition) would be exempt from the PSSR requirements.

However, there were some shortcomings in the overall boiler testing procedures carried out by model engineering societies, and although model engineering activities were exempted from the PSSR requirements, the boundary between what constituted model engineering and that of full-size was a grey one which could only be tested in a court of law. Therefore, the sensible decision
was taken to update the model engineering boiler testing procedures to comply with the PSSR requirements as far as possible. The MELG has therefore continued to work with the HSE, insurance companies, the manufacturers of miniature boilers and the model engineering societies themselves to draft and agree an updated procedure.

These latest changes have culminated in the re-issue of the booklet “The Examination & Testing of Miniature Steam Boilers (revised edition 2012)” – known as the “Green Book”.

So what are the main changes? - These can be summarised as follows:

1> Updated guidance issued in the form of the “Green Book (Nov 2012 issue)”.  
2> A written Scheme of Examination for each boiler is now required.  
3> All boilers are now included under the scheme (including very small boilers).  
4> A new form of single certificate has been introduced which replaces the previous separate certificates for the hydraulic test and steam test stages.  
5> The introduction of an additional 1.5x hydraulic test for new boilers prior to steam test.  
6> A requirement for the pressure gauge to be tested prior to each steam test.  
7> Recommendation that owners maintain a log of steamings and inspections.

There are other changes, but those above are the ones that most affect the everyday procedures that the normal member will encounter.

In reality, the actual test procedure has changed very little from what was being done before, the main changes being in the now extended scope of the test and the associated paperwork.

To keep this article reasonably brief, I will just outline the key stages of performing a test on a boiler, however please bear in mind that the tests will be carried out in accordance with the procedures and standards laid down in the “Green Book”.

All boilers will require a “Written Scheme of Examination” to be prepared at the time of the first test after 1st January 2013. This document is specific to the individual boiler and will include a description of the boiler, its working pressure and limit pressure, the testing regime, and any specific factors to be taken into account during the test. For example, super-heaters are now considered to be part of the pressure system, however it may not be practical to test them in-situ during a hydraulic test. If they are to be excluded from the test then that fact needs to be stated on the “Written Scheme” in section 4.

The Written Scheme document only needs to be prepared once unless the boiler undergoes change of ownership or undergoes major repair or modification.

All boilers must have a unique identification mark in a visible location.

1> New Boiler (Standard Copper boiler 3<500 bar-litres)  
   - Visual examination(s) by Boiler Inspector during construction (strongly recommended).  
   - Cold examination followed by hydraulic shell test at 2x WP.  
   - Cold examination followed by hydraulic re-test (inc fittings) at 1.5x WP.  
   - Pressure Gauge check (including red line at WP).  
   - Cold examination followed by steam accumulation test (not to exceed WP + 10%).  
   - Fittings function check (water gauge + water feed).  
   - Certificate issued (Hydraulic +4 years max, Steam +14 months max).
2> **Hydraulic and Steam re-Test (Standard Copper boiler 3<500 bar-litres)**
   - Cold examination followed by hydraulic re-test (inc fittings) at 1.5x WP.
   - Pressure Gauge check (including red line at WP).
   - Cold examination followed by steam accumulation test (not to exceed WP + 10%).
   - Fittings function check (water gauge + water feed).
   - Certificate issued (Hydraulic +4 years max, Steam +14 months max).

3> **Steam Test only (Standard Copper boiler 3<500 bar-litres)**
   - Pressure Gauge check (including red line at WP).
   - Cold examination followed by steam accumulation test (not to exceed WP + 10%).
   - Fittings function check (water gauge + water feed).
   - Certificate issued (Steam +14 months max).

4> **New Small boiler (<3 bar-litres, pressure gauge fitted)**
   - Visual examination(s) by Boiler Inspector during construction (strongly recommended).
   - Cold examination followed by hydraulic shell test at 2x WP.
   - Cold examination followed by hydraulic re-test (inc fittings) at 1.5x WP.
   - Pressure Gauge check (including red line at WP).
   - Cold examination followed by steam accumulation test (not to exceed WP + 10%).
   - Fittings function check (water gauge + water feed).
   - Certificate issued (Hydraulic (life of boiler), Steam +12 months max).

5> **Re-Test Small boiler (<3 bar-litres, pressure gauge fitted)**
   - Pressure Gauge check (including red line at WP).
   - Cold examination followed by steam accumulation test (not to exceed WP + 10%).
   - Fittings function check (water gauge + water feed).
   - Certificate issued (Steam +12 months max).

6> **New Simple Small boiler (<3 bar-litres, no pressure gauge fitted)**
   - Visual examination(s) by Boiler Inspector during construction (strongly recommended).
   - Cold examination followed by hydraulic shell test at 2x WP.
   - Cold examination followed by hydraulic re-test (inc fittings) at 1.5x WP.
   - Safety-valve functions correctly and stable conditions achieved.
   - Check fuel supply is all used up before water runs out.
   - Certificate issued (Steam +12 months max).

7> **Existing Simple Small boiler (<3 bar-litres, no pressure gauge fitted) - Examination only**
   - Cold examination
   - Safety-valve functions correctly and stable conditions achieved.
   - Check fuel supply is all used up before water runs out.
   - Certificate issued (Steam +12 months max).

Both the “Written Scheme of Examination” and the issued “Boiler Certificate” should be retained by the owner as a record of the boiler’s history, and presented when required as evidence of being tested/examined.

It is also strongly recommended that owners of boilers should obtain a copy of the “Green Book” and familiarise themselves with the requirements relevant to their plant. A copy of the “Green Book” and example forms are available for reference on the notice-board at Balleny Green. Other information is available from the references listed at the end of this article.
In order to ensure compliance with our insurance requirements that valid boiler certificates are held for models being operated at Balleny Green, and also as an aid towards reminding members of when their boilers need to be re-tested, a list of current boiler certificates will be regularly updated and published on the notice-board at Balleny Green. Any boiler not on this list and within test date must not be steamed on the Society’s premises without agreement of the Boiler Inspector in attendance or other responsible officer of the society in his absence.

Although the procedures and paper-work involved appear relatively complex at first sight, for most situations the procedure is straightforward and not onerous. If you foresee the need to request a boiler test within the near future then please speak to one of the Society Boiler Inspectors well in advance – we are there to help and advise you as well as ensure that we all enjoy our hobby in safety.

**Sources of Information :**

“The Examination & Testing of Miniature Steam Boilers (Revised Edition 2012)”
- available from the Southern Federation
or

HSE documents :


Southern Federation publications :


Peter McMillan (Boiler Inspector)
Neal Harrison (Boiler Inspector)
David Smith (Boiler Inspector)
Colin Davis (Boiler Inspector)

31st March 2013
## The Pressure Systems Safety Regulations 2000

Statutory Instrument 2000 No 128 - Regulation 8

Written Scheme of Examination for a Boiler

### 1. Introduction:

1.1 This Written Scheme of Examination has been written in order to comply with the requirements of the Pressure Systems Safety Regulations 2000 (Regulation 8).

1.2 All examination and testing shall be carried out in accordance with the requirements of the formally issued Boiler Test Code entitled 'The Examination and Testing of Miniature Steam Boilers, Boiler Test Code BTC 2012' or the latest edition relevant at the time of the test. The pressure test values and the periodicity of test shall be in accordance with the Code.

### 2. Description of the System:

- **a)** Serial / Boiler (System) Number:
- **b)** Name of Owner:
- **c)** Year of Manufacture:
- **d)** Name of Manufacturer:
- **e)** boiler Material and Method ofJoining:
- **f)** Boiler Type:
  - Fire Tube
  - Water Tube
- **g)** Type of Model:
  - Railway Locomotive or Vehicle
  - Road Vehicle
  - Boat
  - Stationary Plant
  - Other (please specify)
- **h)** Description:
  - [ ] to an existing boiler
  - [ ] a new boiler
- **i)** Gauge or Scale:
  - [ ] Working Pressure (Pw):
  - [ ] Limit (Safe Operating Pressure (P0):
- **j)** psi

### 3. Items to be Examined and Tested:

<table>
<thead>
<tr>
<th>Safety Valve</th>
<th>SV1</th>
<th>SV2</th>
<th>SV3</th>
<th>SV4</th>
<th>Boiler Feed Check Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusible Plug</td>
<td>FP1</td>
<td>FP2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Gauge</td>
<td>PG1</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Water Level Gauge</td>
<td>WLG1</td>
<td>WLG2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Try Cock</td>
<td>TC1</td>
<td>TC2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superheater</td>
<td>SH1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Blow Down Valve</td>
<td>BDV1</td>
<td>BDV2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiler Water Feed Injector</td>
<td>INJ1</td>
<td>INJ2</td>
<td>INJ3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiler Water Feed Mechanical Pump</td>
<td>MP1</td>
<td>MP2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiler Water Feed Hand Pump</td>
<td>HP1</td>
<td>HP2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiler Water Feed Steam/Electric Pump</td>
<td>FP1</td>
<td>FP2</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### 4. Special Requirements:
- Identify any special requirements applicable to this system

### 5. Examinations:

5.1 A new boiler shall be examined in accordance with Sections 7 and 8 indicated in the Code. The new boiler shall comply with the requirements of the Pressure Equipment Regulations 1999 and subsequent Amendments where necessary.

5.2 A previously tested boiler shall be examined in accordance with Section 9 indicated in the Code.

### 6. Preparation for Test:

The boiler shall be prepared for test by the owner in accordance with Section 6 indicated in the Code.

### 7. Initial Hydraulic Pressure Test: (Shell Test)

7.1 A new privately built boiler shall be subjected to an initial hydraulic pressure test in accordance with Section 10 indicated in the Code. The test pressure and duration of test shall be as indicated in the Code.

7.2 A commercially built boiler shall have been tested to the same initial hydraulic pressure test values as indicated in the Code. A certificate of hydraulic test shall have been provided by the manufacturer and will be accepted provided that it is accompanied by a CE Declaration of Conformity in accordance with the requirements of the Pressure Equipment Regulations 1999, where applicable.

7.3 This test is valid for the life of the boiler unless the boiler is subject to repair or modification which would affect the structural integrity of the boiler. In this case the boiler shall be subject to a retest to the values indicated on the initial hydraulic pressure test.

### 8. Subsequent Hydraulic Pressure Tests: (Repeat Tests)

Subsequent hydraulic pressure tests shall be carried out after the completion of the initial hydraulic pressure test and once all the relevant fittings have been attached to the boiler, in accordance with Section 10 indicated in the Code. The test pressure values, duration and periodicity shall be as indicated in the Code.

### 9. Steam Tests:

Steam tests shall be carried out in accordance with Section 11 indicated in the Code. The tests shall be carried out after the subsequent hydraulic pressure test at the specified intervals indicated in the Code.

### 10. Records:

10.1 Record of Reviews and Modifications to the Written Scheme of Examination shall be undertaken by the Model Engineering Liaison Group only.

10.2 Record of Modifications to the System shall be recorded on a replacement Written Scheme of Examination.

### 11. Certification:

11.1 This unique Written Scheme of Examination (WSE) shall be used in conjunction with the formally approved Hydraulic and Steam Test Certificate issued by the relevant Federations, Associations and Societies identified in the Code.

11.2 All relevant information required by the Pressure Systems Safety Regulations 2000 shall be recorded on the appropriate certificates and supporting documentation.

11.3 This Written Scheme of Examination forms part of the package of documentation that shall be retained by the owner of the boiler and subsequently passed on to the new owner if the boiler is sold.

11.4 This Written Scheme of Examination and certification shall be retained in accordance with the requirements of the Pressure Systems Safety Regulations 2000, Regulation 14.

### Name of Club/Society:

This Written Scheme of Examination is controlled by the Model Engineering Liaison Group whose Chartered Engineer is Mr W C Pearson CEng MIMechE.

The Controlling Engineer (as described in Pressure Systems Safety Regulations 2000 Regulation 8 Paragraph 106) for this scheme is -

### Controlling Engineer (Boiler Inspector) Name:

**Signature:**

### Date Written Scheme of Examination prepared:

[Date]
## Examination Certificate of a Pressure System

### Pressure Systems Safety Regulations 2000

<table>
<thead>
<tr>
<th>1. Relevant Organisation:</th>
<th>7½&quot; Gauge Society / Northern Association of Model Engineers / Southern Federation of Model Engineering Societies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a) Owner's Name:</td>
<td></td>
</tr>
<tr>
<td>2b) Location of System:</td>
<td>[i.e. location where examined]</td>
</tr>
<tr>
<td>3. Item/System Details:</td>
<td>A boiler built commercially after 30 May 2002 shall not be tested unless it carries appropriate CE marking (see BTC para 6.4)</td>
</tr>
<tr>
<td>a) Serial/Boiler (System) Number:</td>
<td></td>
</tr>
<tr>
<td>b) Year Boiler Built:</td>
<td></td>
</tr>
<tr>
<td>c) Name of Boilermaker:</td>
<td></td>
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<tr>
<td>d) Boiler Material:</td>
<td></td>
</tr>
<tr>
<td>e) Type of Model:</td>
<td>Railway Locomotive / Vehicle / Road Vehicle / Boat / Stationary Plant / Other (please specify)</td>
</tr>
<tr>
<td>f) Description:</td>
<td>(e.g. Steam, Hot Water, etc., for internal use)</td>
</tr>
<tr>
<td>g) Gauge or Scale:</td>
<td></td>
</tr>
<tr>
<td>h) Boiler volume in litres:</td>
<td></td>
</tr>
<tr>
<td>i) Bar litres of boiler:</td>
<td></td>
</tr>
<tr>
<td>j) Registration No:</td>
<td></td>
</tr>
</tbody>
</table>

### 4. Examination Undertaken:

| 4a) Cold Examination and Hydraulic (Shell) Test | Yes / No | Note: Test Pressure is 2 times working pressure - see BTC Sections 7 & 8 |
| Test Pressure Applied ________ psi for a Working Pressure (PW) of ________ psi |
| 4b) Cold Examination and Hydraulic (Repeat) Test | Yes / No | Note: Test Pressure is 1½ times working pressure - see BTC Section 9 |
| Test Pressure Applied ________ psi for a Working Pressure (Pw) of ________ psi |
| 4c) Cold Examination and Hydraulic Test carried forward from Certificate Number: |
| Working Pressure (Pw) of ________ psi showing a Date next Cold Examination and Hydraulic Test due (i.e. hydraulic test expiry date) |
| DD MM YY Strike through if not carried forward certificate |
| 4d) Cold Examination and Steam Test | Yes / No |                                                                 |

### 5. System parts not Examined: (e.g. because cladding not removed) (continue overleaf if necessary)

### 6. Repairs Needed and Timescale for Completion: (continue overleaf if necessary)

### 7. Result of Examination:

| 7a) Cold Examination and Hydraulic (Shell) Test: | Pass / Fail / Not Undertaken |
| Cold Examination and Hydraulic (Repeat) Test:   | Pass / Fail / Not Undertaken |
| Date next Cold Examination and Hydraulic Test due: (i.e. hydraulic test expiry date) | DD MM YY Strike through if Repeat Hydraulic Test not undertaken |
| Cold Examination and Steam Test:                | Pass / Fail / Not Undertaken |
| Working Pressure (Pw) psi:                      | Strike through if Steam Test not undertaken |
| Date next Cold Examination and Steam Test is due: (i.e. steam test expiry date strikes through if not undertaken) | DD MM YY |

### 8. Notes: (e.g. 'Cladding Removed' including 'Other Observations', 'Reason for Fail' or 'Defects which may give rise to imminent Danger')

### Name of Club/Society: 

### Affiliation Number of Club/Society:

### Declaration: I have concluded my examination of the System detailed above in the manner and to the extent described in the Examination and Testing of Miniature Steam Boilers Revised Edition 2012 and any subsequent revisions and in the Written Scheme of Examination and in any related report(s) and this is a true statement of the result of the examination. The record of the Examination and Test consists of this certificate and the related documentation.

### Inspector Name: 

### Inspector Signature:

### Witness Name: 

### Witness Signature:

### Note: If the Inspector is authorised by his Club/Society to conduct tests without a witness write 'Not Required' (see Boiler Test Code paragraph 3.9f)

### Date the Examination took place: 

### Date of this Certificate:

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Page 6 of 7
The Pressure Systems Safety Regulations 2000
Statutory Instrument 2000 No 128 Regulation 8
Written Scheme of Examination for a Boiler below 3 bar litres

1. Introduction
1.1 This Written Scheme of Examination has been written in order to comply with the requirements of the Pressure Systems Safety Regulations 2000 Regulation 8.
1.2 All examination and testing shall be carried out in accordance with the requirements of the formally issued Boiler Test Code Entitled The Examination and Testing of Miniature Steam Boilers, Boiler Test Code BTC 2012 or the latest edition relevant at the time of the test. The pressure test values and the periodicity of test shall be in accordance with the Code.
1.3 Small boilers shall comply with the requirements indicated in paragraph 1.6 of the Boiler Test Code BTC 2012.

2. Test Requirements
2.1 Examination and Testing shall be carried out in accordance with the requirements indicated in Section 14 of the Boiler Test Code BTC 2012.

3. Boiler Material (Boiler Inspector to delete material not used) Copper Brass

4. Items to be examined and tested. (Boiler Inspector to delete items not fitted)
Safety Valve SV1 Pressure Gauge PG1 Water Level Gauge WLG1 Boiler Water Feed Pump MP1

5. Certification
5.1 This unique Written Scheme of Examination (WSE) shall be used in conjunction with the formally approved Hydraulic and Steam Test Certificate issued by the relevant Federations and Associations identified in the Code.
5.2 All relevant information required by the Pressure Systems Safety Regulations 2000 shall be recorded on the appropriate certificate and supporting documentation.
5.3 This Written Scheme of Examination forms part of the package of documentation that shall be retained by the owner of the boiler and subsequently passed to the new owner if the boiler is sold.
5.4 This Written Scheme of Examination and certification shall be retained in accordance with the requirements of the Pressure Systems Safety Regulations 2000 Regulation 14.

This Written Scheme of Examination is controlled by the Model Engineering Liaison Group whose Chartered Engineer is Mr W C Pearson CEng MIMechE
The controlling engineer (Boiler Inspector) as described in Pressure Systems Safety Regulations 2000 Regulation 8 Paragraph 106 for the scheme is:

Boiler Inspector Name: Signature: Date Prepared:

CERTIFICATE OF ANNUAL INSPECTION AND STEAM TEST FOR BOILERS BELOW 3.00 bar litres

Name of Club/Society: Number:

Boiler Identity No. Box A
Date of Construction: Description of model:
Manufacturer: Hydraulics (Shell Test) psi/bar
Test Date: Hydraulics (Repeat Test) psi/bar
Test Date: Working Pressure psi/bar
Volume of boiler litres bar litres

Previous Certificate No. Box B
Date of test: Date of expiry:
Pressure gauge confirmed working YES/NO
Marked working pressure psi/bar
Safety valves seen to operate psi/bar
Repairs (if any) and the date by which they should be carried out

Boiler Inspector (Block capitals) Signature
Witness (Block capitals) Signature
Owner (Block capitals) Signature

In signing this certificate the owner accepts that it is his/her responsibility to maintain the boiler in a safe working condition at all times. The boiler may only be used if the owner is in possession of a valid steam test certificate. THE BOILER INSPECTOR ACCEPTS NO LIABILITY IN REGARD TO THE USE AND MAINTENANCE OF THE BOILER. After its expiry, this certificate should be retained as a record.